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IS 15766-2 (2007): Grading of polished diamonds, Part 2: Test Methods [MTD 10: Precious Metals]

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भारतीय मानक

पालिश हीरों की ग्रेडिंग

भाग 2 परीक्षण पद्धतियाँ

Indian Standard

GRADING OF POLISHED DIAMONDS

PART 2 TEST METHODS

ICS 03.120.20; 39.060

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 2007

Price Group 13

FOREWORD

This Indian Standard (Part 2) was adopted by the Bureau of Indian Standards, after the draft finalized by the Precious Metals Sectional Committee had been approved by the Metallurgical Engineering Division Council.

Diamond industry is one of the most important sectors of the Indian Economy earning the much needed foreign exchange to the exchequer. It also provides large number of employment opportunities to the masses in India. As on today every 9 out of 10 diamonds sold in the world markets are cut and polished in India. Diamond Industry, which is an important segment of the Indian Economy should have its own grading standards for the quality aspect based on the 4 C's (Colour, clarity, cut and carat weight).

In the international scenario of diamond markets, there exists distinct grading standards such as GIA in USA, HRD and CIBJO in Europe, however in India there is no standard of its own followed by the Indian diamond industry. Under the circumstances on the line with the existing International Standards, Bureau of Indian Standards has developed certain parameters for grading the quality of diamonds, and hereby presents the same as the Indian Standards for diamond grading.

Diamond grading standards are very subjective. The accuracy of the grading depends, to a great extent, on the knowledge, expertize of the graders and also the instruments and equipments available for grading. The adoption and implementation of the system has to begin with the manufactures, dealers and exporters of diamonds. With the implementation of Indian Standards, the end users will benefit immensely by way of quality assurance of the diamonds and there by the customer confidence will be boosted.

A list of instruments required for gem testing laboratory is given in Annex A for guidance only.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

The standard is published in two parts, other part in the series is:

Part 1 Classification.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 JUNE 2010
TO
IS 15766 (PART 2) : 2007 GRADING OF POLISHED DIAMONDS

PART 2 TEST METHODS

[*Page* 42, *Annex* A, *Sl No.* (ix)] — Substitute the following for the existing:

‘Weighing balance with accuracy of 0.001 ct. and specific gravity attachment’.

[*Page* 42, *Annex* A, *Sl No.* (xvii)] — Substitute the following for the existing:

‘Instruments to detect synthetic and/or treated type of diamonds.’

(MTD 10)

Reprography Unit, BIS, New Delhi, India

Indian Standard

GRADING OF POLISHED DIAMONDS

PART 2 TEST METHODS

1 SCOPE

This standard specifies methods for the grading of natural unmounted polished diamonds within the D (exceptional white +) to Z (tinted) series and the grading criteria, other than for the colour of naturally coloured diamonds.

2 REFERENCE

The following standard contains provision, which through reference in this text, constitutes provision of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision and parties to agreement based on this standard is encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	*Title*
IS 15766 (Part 1): 2007	Grading of polished diamonds: Part 1 Classification

3 TERMS AND DEFINITIONS

For the purposes of this standard the terms and definitions given in IS 15766 (Part 1) and the following apply.

3.1 First Generation Masterstone — Diamond that has been selected by direct comparison with the relevant masterstone in the set of masterstones originally used to establish the D to Z grades as specified in **7.1.1** of IS 15766 (Part 1) and equal in hue, tone and saturation to the relevant original masterstone.

3.2 Second Generation Masterstone — Diamond that has been selected by direct comparison with the relevant first generation masterstone of IS 15766 (Part 1) and equal in hue, tone and saturation to the relevant first generation masterstone.

4 IDENTIFICATION

It shall be the responsibility of the examiner to establish that the stone under examination is a diamond in accordance with **2.1** of IS 15766 (Part 1) and be aware of the possibilities of the stone being a synthetic diamond, a treated diamond or an assembled stone.

5 WEIGHT AND MEASUREMENTS

5.1 Weight

Maintain all balances used to establish the carat weight of diamonds to ensure accuracy. Prior to weighing, all diamonds shall be clean.

5.2 Measurements

Use instruments accurate in millimetres to two decimal places to measure the dimensions of a diamond. Measurement parameters are specified in **6.2** of IS 15766 (Part 1). For round stones, determine minimum and maximum diameters by making at least four measurements at differing points on the diameter of the diamond. Clearly establish minimum and maximum diameter measurements.

For stones other than rounds, determine minimum and maximum diameters by making two measurements (or more, if applicable) across the apparent length and width of the diamond. Clearly establish the length and width plus any other descriptive measurements.

For determining depth (total height), make measurements perpendicular to the table facet and record the established maximum figure on the report.

6 COLOUR AND FLUORESCENCE

6.1 Cleaning of Masterstones

Prior to grading, clean each masterstone with an organic solvent for example ethyl alcohol. Masterstones with dirty girdles and encrusted diamonds shall be cleaned by appropriate means (for example by boiling in an acid like hydrochloric acid).

Keep the masterstones clean.

6.2 Masterstones for Colour

Use only round, brilliant-cut diamonds for this purpose. First generation masterstones shall be not smaller than 0.60 ct. Second generation masterstones shall be not smaller than 0.30 ct. Masterstones shall not have internal characteristics that are eye visible under normal or corrected-to-normal vision, or otherwise affect colour or decrease the transparency when viewed through the pavilion. The fluorescence shall be not greater than the grade 'Faint'. Finish shall be at least 'Good'. Proportions shall be in the 'A range'. All stones in a set shall be of similar weight and proportions, and the nature of the girdles shall be the same.

Masterstones shall be of the 'Yellow series' and shall be positioned at the lower limit of maximum saturation for each grade.

All masterstones in any one set shall be positioned at the lower limit for each grade.

The second generation of masterstones shall be the last generation that shall be used by laboratories for the issuing of test reports.

6.3 Procedure

6.3.1 *Precautions*

Do not grade for colour immediately following grading for fluorescence.

Persons colour grading diamonds shall be aware of the "tiring factor" and limit the time spent grading according to their individual capabilities.

6.3.2 *Cleaning*

Prior to grading, clean each submitted diamond with an organic solvent for example ethyl alcohol. Diamonds with dirty girdles and encrusted diamonds shall be cleaned by appropriate means (for example, by boiling in an acid like hydrochloric acid).

6.3.3 *Comparisons*

The colour of the diamond to be graded shall be determined by visual comparison with masterstones and shall be observed from the pavilion side between being almost parallel to the level of the girdle to being perpendicular with the pavilion facets (*see* Fig. 1). Place the stone between two of the masterstones and move the stone until the correct position is found. Only view the diamond through the crown side to determine, if it is a 'coloured diamond'.

6.3.4 *Round Stones*

Round stones shall be examined in several directions within the rotation axis indicated in Fig. 1. If different colours are observed, the predominant D to Z grade shall be conclusive.

6.3.5 *Fancy Shapes*

The colour of fancy-shaped diamonds shall be graded in the directions indicated in Fig. 2. In the case of cuts with points or corners, these directions shall not be taken into account. If different colours are observed, the predominant D to Z grade shall be conclusive.

6.3.6 *Colours*

Colours such as brown, brownish-yellow, grey, grayish-yellow (in the D-Z grades) shall be graded as if they were within the same colour series as the masterstones. However, for grades M and below, such stones shall also be evaluated in the face-up position for the description indicating the presence of these hues.

6.3.7 *Lighting*

Colour grading shall be carried out under an artificial light source with a stable light output and simulating illuminant $D_{55} - D_{65}$ in a light intensity of approximately 2 200 lx.

The masterstones and the stone to be graded shall be placed with the table down on a dull white background under the central area of the tube. Reflections and distractions from the environment shall be excluded.

Prevent direct view of the light sources.

NOTE — A convenient artificial light source is a commercial tubular fluorescent lamp with colour temperature of 5 500 K to 6 500 K.

6.3.8 *Positioning*

The diamond being graded and the masterstones shall be placed directly below the light source. For an observer with normal eyesight, the distance between the light source and the diamond being graded shall be approximately 20 cm and the light intensity at that point shall be approximately 2 200 lx (*see* Fig.1).

6.3.9 *The Grade*

The colour grade shall be given with one full colour grade or colour corresponding term in accordance with **7.1.1** and **7.2** of IS 15766 (Part 1). Combined grades shall be used in accordance with Table 1 of IS 15766 (Part 1).

6.3.10 *Master-Eye Effect*

When comparing diamonds with a masterstone, the master-eye effect can occur (*see* Fig. 3).

6.4 Description of Fluorescence

6.4.1 *Equipment and References*

The fluorescence description of a diamond shall be recorded when the stone is observed under a long-wave UV lamp (approximately 365 nm) that has an output of 4 W to 8 W.

The description shall be made by comparison with a series of masterstones that characterize the intensities none or ni, faint or slight, medium and strong in accordance with **7.3** IS 15766 (Part 1).

Three masterstones shall be required to achieve the correct fluorescence description for each diamond (*see* **6.4.2**).

The masterstones and the stone under examination shall be positioned on a matt black background.

6.4.2 *Masterstones for Fluorescence*

The masterstones shall be positioned at the maximum intensity of fluorescence for the intensities, none, slight, medium and strong and have a blue type fluorescence. The weight of each masterstone shall be a minimum of 0.25 ct, and the shape shall be round.

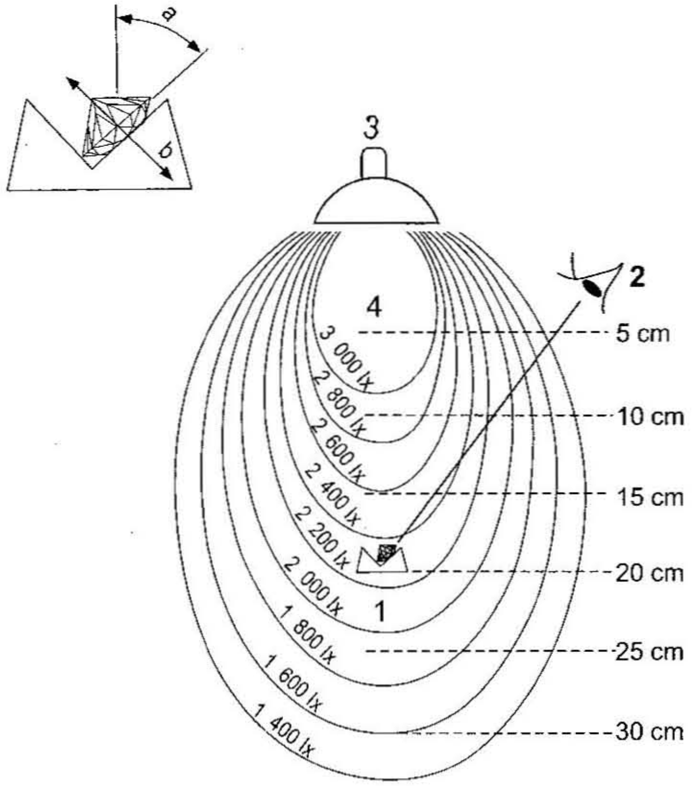
6.4.3 *Working Conditions and Methodology*

The lighting conditions in the room used for comparing the fluorescence of a diamond against the fluorescence masterstones shall not have an effect upon the stone under examination or the masterstones. The stone under examination and the masterstones shall be positioned at a distance of approximately 10 cm from the UV source and examined from the pavilion side from being almost parallel to the level of the girdle to perpendicular with the pavilion facets, and an overall impression is gained.

6.4.4 *Fluorescence, Other than Blue*

If the hue of the fluorescence is other than blue, the intensity shall be considered in relation to the masterstones.

NOTE — The hue may also be registered.



1 Our comparison
2 Naked eye
3 Light source
a Viewing angle
b Rotation axis

FIG. 1 COLOUR GRADING CRITERIA

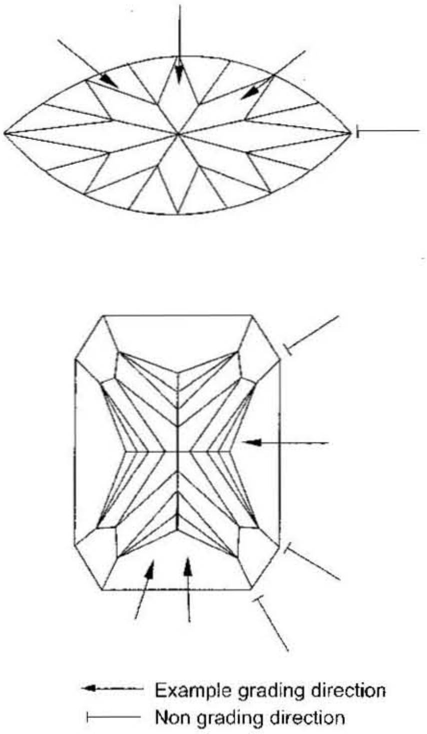
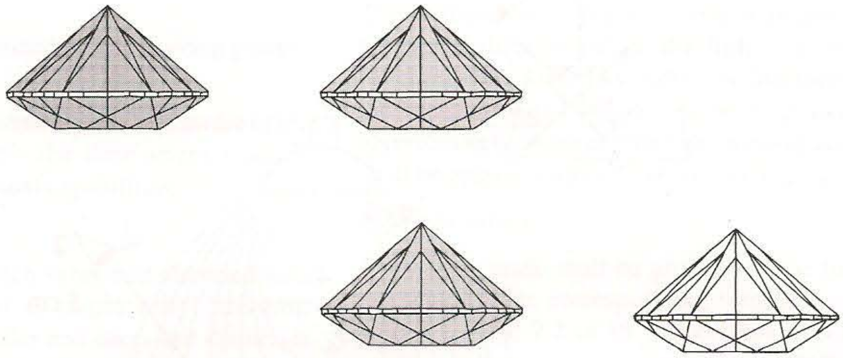
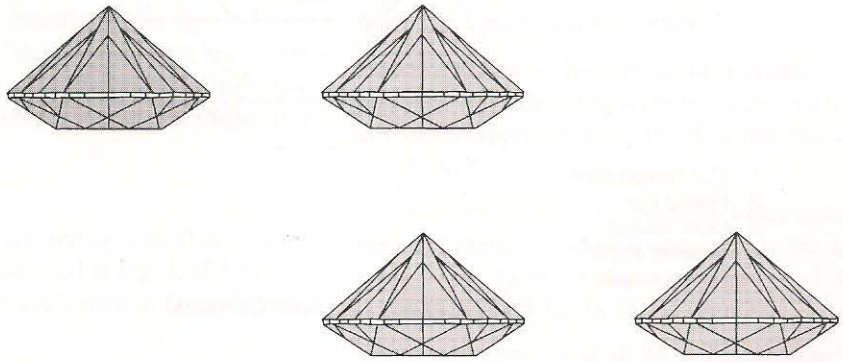


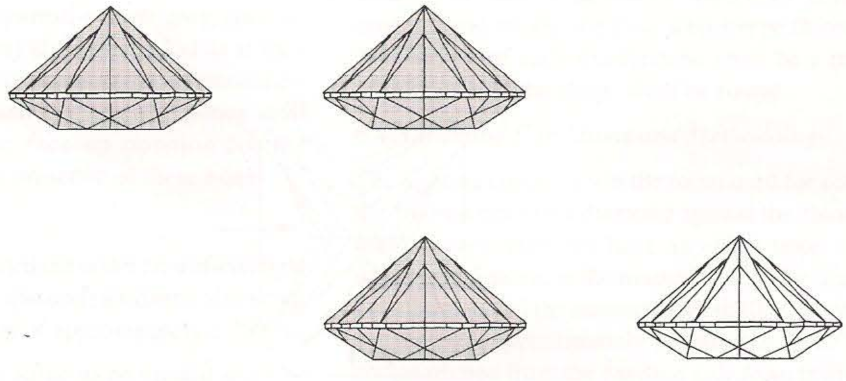
FIG. 2 EXAMPLES OF COLOUR GRADING DIRECTIONS AND DIRECTIONS IN WHICH COLOUR GRADING SHALL NOT BE MADE FOR FANCY-CUT DIAMONDS WITHIN THE D-Z RANGE



a) The stone appears darker on the left side of the master and appears equally lighter on the right, the stone is graded the same colour as the masterstone.



b) The stone appears darker on the left and the same as the masterstone on the right, the stone is graded darker than the masterstone



c) The stone appears to be the same on the left side of the masterstone and lighter on the right, the stone is graded lighter than the masterstone

FIG. 3 MASTER-EYE EFFECT

7 CLARITY

7.1 General

Clarity grading shall be determined in accordance with the example diagrams given under **7.3.10**, as well as with **8** of IS 15766 (Part 1). The practical grading for clarity shall be made with the greatest caution and shall not be made under time pressure. Experience and regular practice shall be required to achieve accurate and consistent results. Before it is graded, the stone shall be properly cleaned (*see* **6.3.2**). A thorough examination through and on each of the diamond's numerous facets, and along the entire girdle, shall be carried out.

7.2 Apparatus

The basic tool for clarity grading shall be the diamond loupe in accordance with **2.15** of IS 15766 (Part 1). A microscope may be used to find internal and external characteristics, but only those characteristics seen with the diamond loupe shall determine the grade.

NOTE — The use of tweezers is suggested for holding a diamond.

7.3 Procedure

7.3.1 *General*

To determine the clarity grade of a diamond, no factors other than visibility shall be taken into account.

NOTE — Generally, inclusions observed through the crown of a diamond have a greater effect upon the clarity grade than those seen through the pavilion only.

7.3.2 *Lighting*

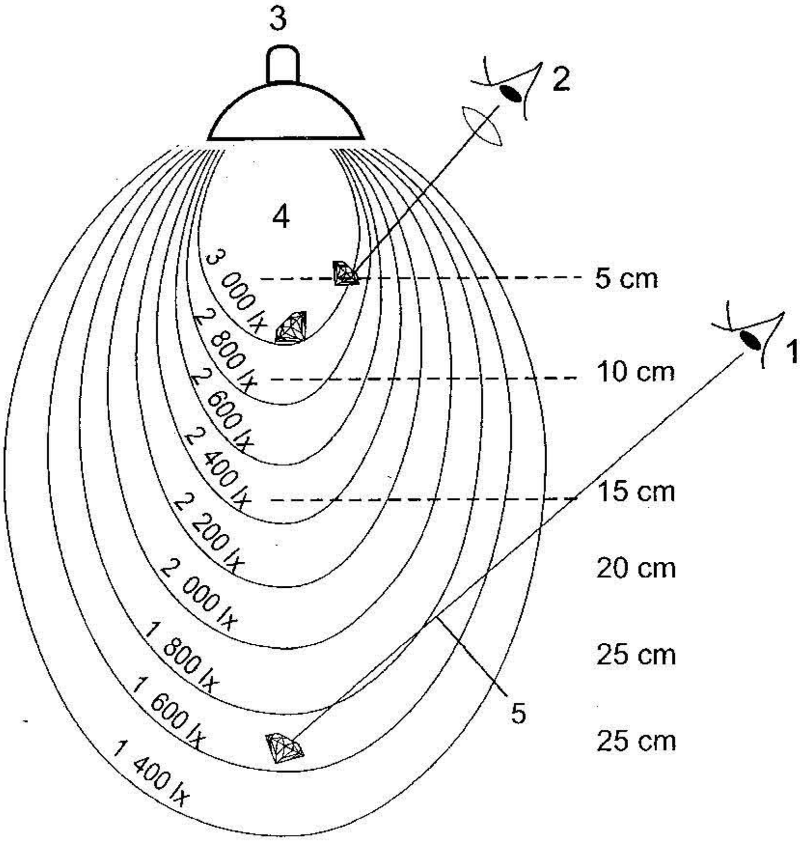
Clarity grading shall always be carried out under an artificial light source with stable light output.

The light intensity at a distance of 20 cm shall be approximately 2 200 lx (*see* Fig. 4).

NOTE — A convenient artificial light source is a commercial tubular fluorescent lamp with corrected colour temperature of 5 500 K to 6 500 K.

7.3.3 *Distance*

A diamond being graded shall be held under the lamp at a distance of between 5 cm and 10 cm. Reflections and distractions from the environment shall be excluded. To determine the visibility of internal and external characteristics with the naked eye, the diamond shall be held at a distance from the lamp of approximately 30 cm, in a position that allows light to enter through the crown, and only minimally through the pavilion (*see* Fig. 4).



Key

1 Naked eye
2 Loupe
3 Light source
4 Clarity
5 Clarity transparency

FIG. 4 CLARITY GRADING CRITERIA

7.3.4 *Plotting*

Plot clarity grading characteristics on a diagram that describes the crown and pavilion facet arrangement of the diamond being graded. Common shapes of various diamond cuts are specified in **9.2** of IS 15766 (Part 1). The plot diagram on the report shall generally reflect the outline of the diamond combined with the facet distribution, without necessarily reflecting the ratios of length and width.

Place the diagram on the report with the crown and pavilion views orientated so that an identical point on the girdle of the two is positioned where they are closest to each other.

Plot internal and external characteristics placed on the report diagram as accurately as possible in terms of size, position and nature.

Plot internal characteristics in red. Plot external characteristics in green. Plot characteristics found to be in the crown and/or girdle portions of the diamond on the crown diagram, and those in the pavilion portion on the pavilion diagram. Plot any characteristics visible through the crown to the naked eye on the crown diagram. If a feather cuts the pavilion, then it shall be plotted on the pavilion even if it is visible with the naked eye from the crown.

Plot reflecting or mirrored internal characteristics in their actual position only.

Accurately record on worksheets all internal and external characteristics, in terms of position, size and nature.

Plot external characteristics that affect the symmetry grade on the report using the same plot diagram as that used to plot the clarity characteristics, or mention them in the comments section.

NOTE — The purpose of plotting clarity characteristics on a report is only to describe the concluded grade.

7.3.5 *Plotting Symbols*

Use the plotting symbols given in Table 1 and Table 2 to record internal and external characteristics on reports and worksheets.

7.3.6 *Laser Drill Holes*

Grade laser drill holes as internal characteristics.

7.3.7 *Surface Grain Lines*

For the effect of surface grain lines on the final grade, *see* Table 3, as well as **B-2** and **B-3** of IS 15766 (Part 1).

7.3.8 *Internal graining*

In the instances of loupe clean grade stones, when minor internal graining which is not reflective, white or coloured is observed, the remark 'minor graining present' shall be made in the comments section (*see* Table 4).

When internal graining is at least fairly easy to find with 10 × magnification, the remark 'Structural phenomena influencing clarity grade' shall be made in the comments section (*see* Table 4).

7.3.9 *General*

Grade all the clarity characteristics specified in Annex B of IS 15766 (Part 1) in accordance with **8.1** and **8.2** of IS 15766 (Part 1).

7.3.10 *Clarity Examples*

The grading of internal or external characteristics specified in **8.2** of IS 15766 (Part 1) shall be explained through the following examples. When comparing the following examples with a diamond being graded, the transparency, colour and brightness of the diamond's internal or external characteristics shall be taken into account. The following diagrams are based upon observations made with diamonds weighing approximately 1 ct and shall be used in conjunction with the grade descriptions given in **8.2** of IS 15766 (Part 1).

The example diagrams that follow are artistic impressions of observations made for individual diamonds and shall not be confused with report plotting requirements (*see* **7.3.4** and **7.3.5**).

For the example diagrams given here from VVS to I3/P3, extra facets and naturals are included either as identification characteristics or expressions of polish and/or symmetry deviations. Graders are reminded that the purpose of plotting clarity characteristics on a report is solely to describe the concluded grade.

7.3.10.1 *Flawless (FL) or loupe clean (LC)*

FL diamonds shall be free from internal characteristics/inclusions and external characteristics/blemishes when examined under 10 × magnification. LC diamonds shall be free from internal characteristics/inclusions when examined under 10 × magnification (*see* Fig. 5).

7.3.10.2 *Clarity grade flawless (FL) or loupe clean (LC)* (see *Fig. 5 to Fig. 8*)

7.3.10.3 *Internally flawless (IF) or loupe clean (LC)*

IF diamonds shall be free from internal characteristics/inclusions and only possess external characteristics/blemishes when examined under 10 × magnification LC diamonds shall be free from internal characteristics/inclusions when examined under 10 × magnification (*see* Fig. 9).

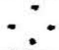
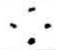
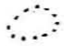
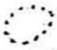
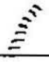
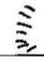
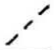
7.3.10.4 *Clarity grade internally flawless (IF), or loupe clean (LC)* (see *Fig.10 to 17*)

7.3.10.5 *Very very slightly included/very very small inclusions V VS 1*

V VS 1 diamonds shall contain minute internal characteristics/inclusions which shall be extremely difficult to observe when examined under 10 × magnification (*see* Fig. 18).

Table 1 Internal Characteristics

(*Clause* 7.3.5)

KEY	1C[a], 2P[b] PLOT IN RED	1P[c], 2C[d] PLOT IN RED
PINPOINT INCLUSION		
GROUP OF PINPOINTS		
CRYSTAL INCLUSION		
DARK INCLUSION		
CLOUD		
CLEAVAGE		
BEARDED GIRDLE		
LASER DRILLING		
GROWTH LINES,GRAINING, GRAIN PLANES		
BRUISE		
CAVITY		
CHIP		
FEATHER		
GRAIN CENTRE		
KNOT		
NEEDLE		

a LOCATED IN CROWN AS SEEN THROUGH THE CROWN.

b LOCATED IN PAVILION AS SEEN THROUGH THE PAVILION.

c LOCATED IN PAVILION AS SEEN THROUGH THE CROWN.

d LOCATED IN CROWN AS SEEN THROUGH THE PAVILION.

7.3.10.6 *Clarity grade V VS I* (see *Fig. 19 to Fig. 26)*

7.3.10.7 *Very very slightly included/very very small inclusions V VS 2*

V VS 2 diamonds shall contain minute internal characteristics/inclusions which shall be very difficult to observe when examined under 10 × magnification (*see* Fig. 27).

7.3.10.8 *Clarity grade V VS 2* (see *Fig. 28 to Fig. 35)*

7.3.10.9 *Very slightly included/Very small inclusions VSI* (see *Fig. 36*)

VS1 diamonds shall contain minor internal characteristics/inclusions which shall be difficult to observe when examined under 10 × magnification.

7.3.10.10 *Clarity grade VS1* (see *Fig. 37 to Fig. 44)*

7.3.10.11 *Very slightly included/very small inclusions VS2* (see *Fig. 45*)

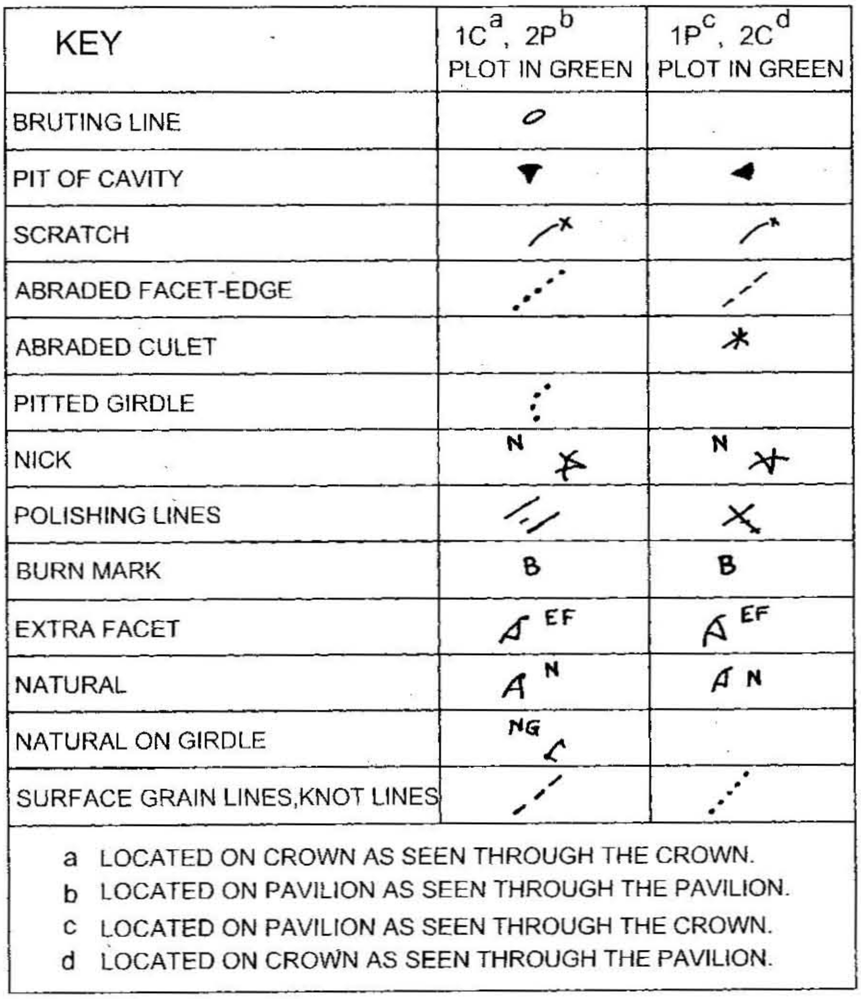
VS2 diamonds shall contain minor internal characteristics/inclusions which shall be somewhat easy to observe when examined 10 × magnification.

7.3.10.12 *Clarity grade VS2* (see *Fig. 46 to Fig. 54)*

7.3.10.13 *Clarity grade SI1* (see *Fig. 55 to Fig. 62)*

Table 2 External Characteristics

(*Clause* 7.3.5)



KEY	1C[a], 2P[b] PLOT IN GREEN	1P[c], 2C[d] PLOT IN GREEN
BRUTING LINE		
PIT OF CAVITY	▼	◀
SCRATCH		
ABRADED FACET-EDGE		
ABRADED CULET		*
PITTED GIRDLE		
NICK	N	N
POLISHING LINES		
BURN MARK	B	B
EXTRA FACET	EF	EF
NATURAL	N	N
NATURAL ON GIRDLE	NG	
SURFACE GRAIN LINES,KNOT LINES		

a LOCATED ON CROWN AS SEEN THROUGH THE CROWN.

b LOCATED ON PAVILION AS SEEN THROUGH THE PAVILION.

c LOCATED ON PAVILION AS SEEN THROUGH THE CROWN.

d LOCATED ON CROWN AS SEEN THROUGH THE PAVILION.

Table 3 Surface Graining Visibility: The Effect Upon the Clarity Grade and Comments

(*Clause* 7.3.7)

Visibility 10 (1)	Option 1 (2)	Option 2 (3)
Not found or very hard to find	LC	FL
Hard to find	LC Minor surface grain lines[1]	IF Minor surface grain lines[1]
Fairly easy to find	LC Surface grain lines are present[1]	IF Surface grain lines are present[1]
Easy to find	To be regarded as internal graining	

[1] Comment only to mentioned with LC and IF, and the most important description alone shall be mentioned.

Table 4 Graining Visibility: The Effect Upon the Clarity Grade and Comments

(*Clause* 7.3.8)

Visibility 10 (1)	Option 1 (2)	Option 2 (3)
Not found or very hard to find, not reflective, white, coloured	LC	FL
Hard to find Not reflective, white, coloured	LC Minor graining present (1)	IF Minor graining present[1]
Fairly easy to find, hardly or not reflective, white, coloured	LC graining present[1]	IF graining present[1]
Easy to find, reflective, white, coloured	V VS 1 Structural phenomena influencing clarity grade	V VS 1 Structural phenomena influencing clarity grade

[1] Comment only to be mentioned with LC and FL, and the most important description alone shall be mentioned.

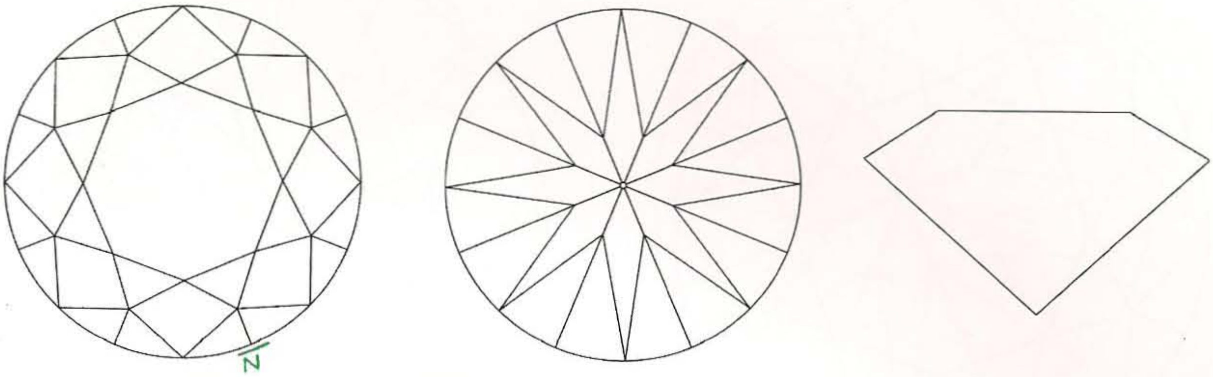


FIG. 5 A MINOR NATURAL

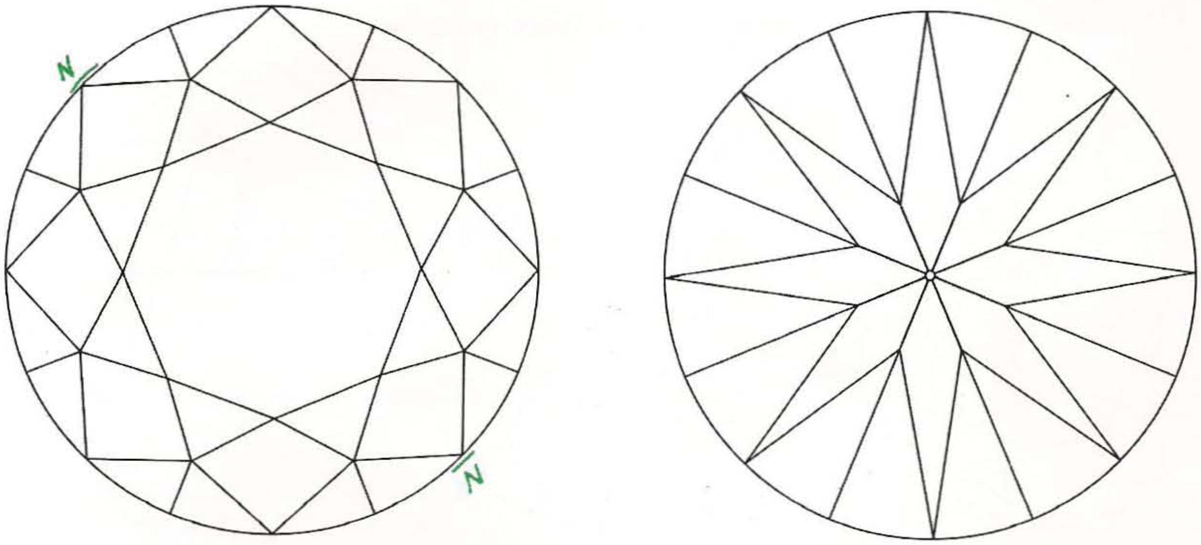


FIG. 6 MINOR NATURALS

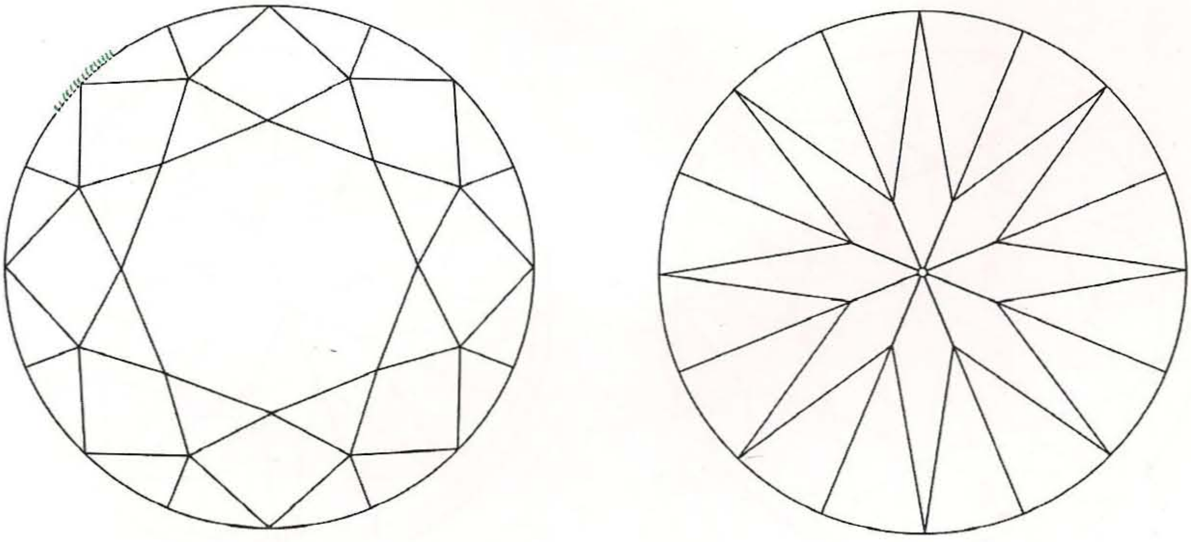


FIG. 7 MINOR PITTED GIRDLE

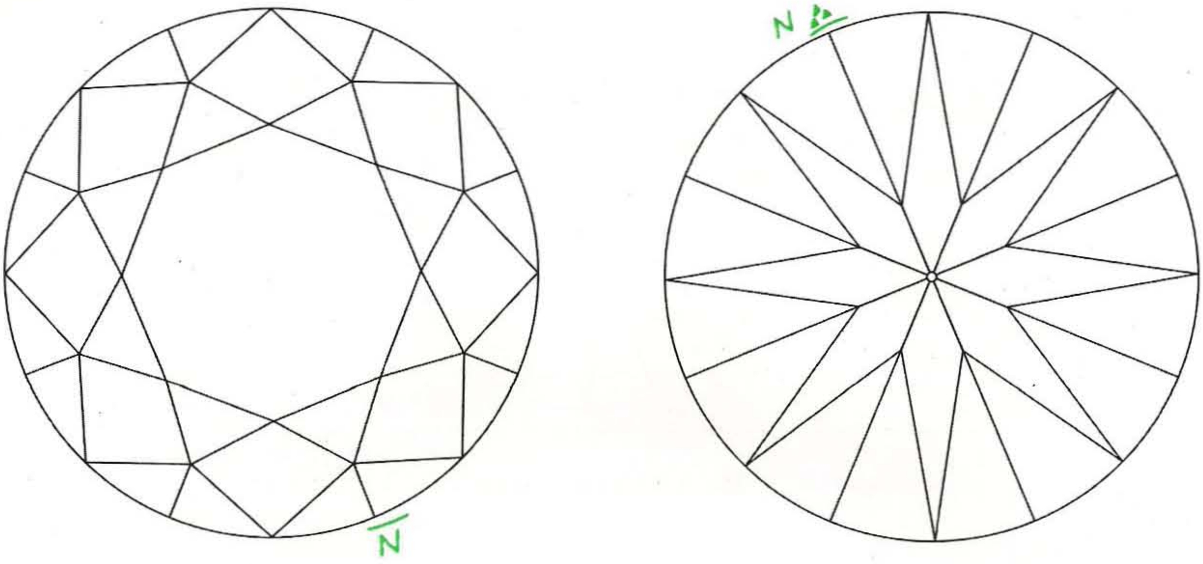


FIG. 8 MINOR NATURALS, ONE WITH TRIGONS

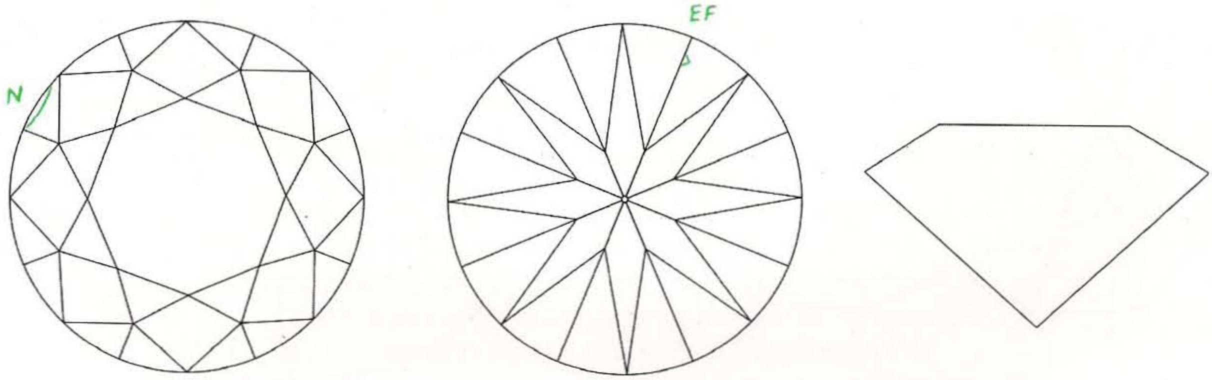


FIG. 9 A NATURAL AND A MINOR EXTRA FACET

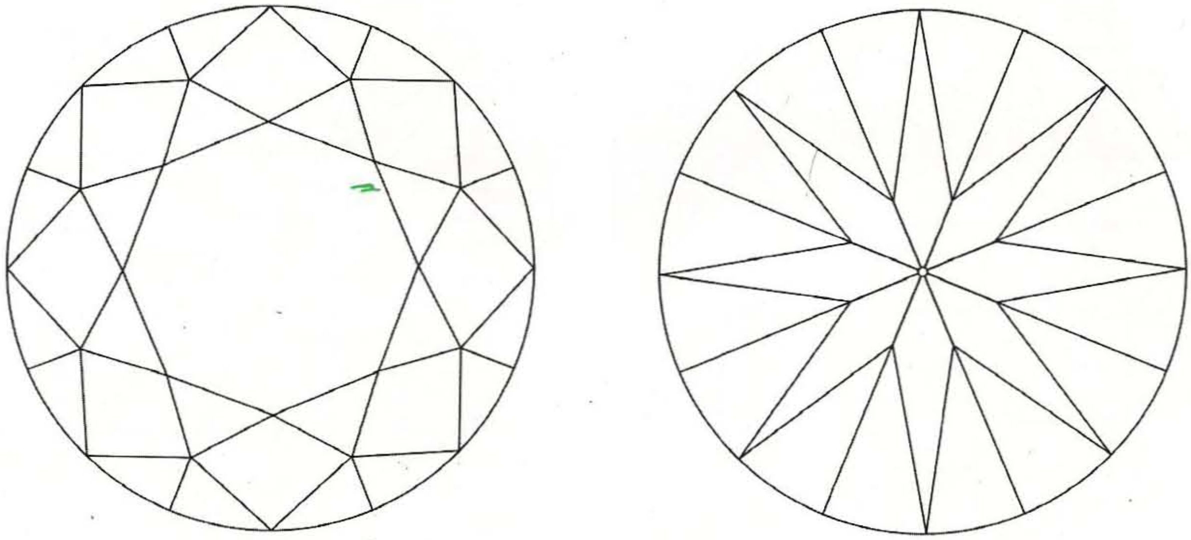


FIG. 10 MINOR SCRATCHES

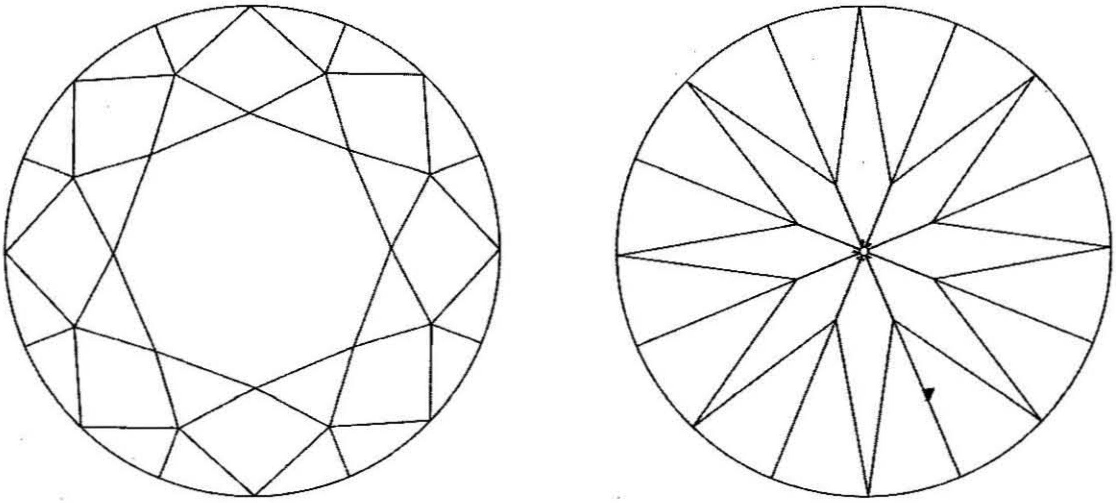


FIG. 11 A MINOR PIT AND A SLIGHTLY ROUGH CULET

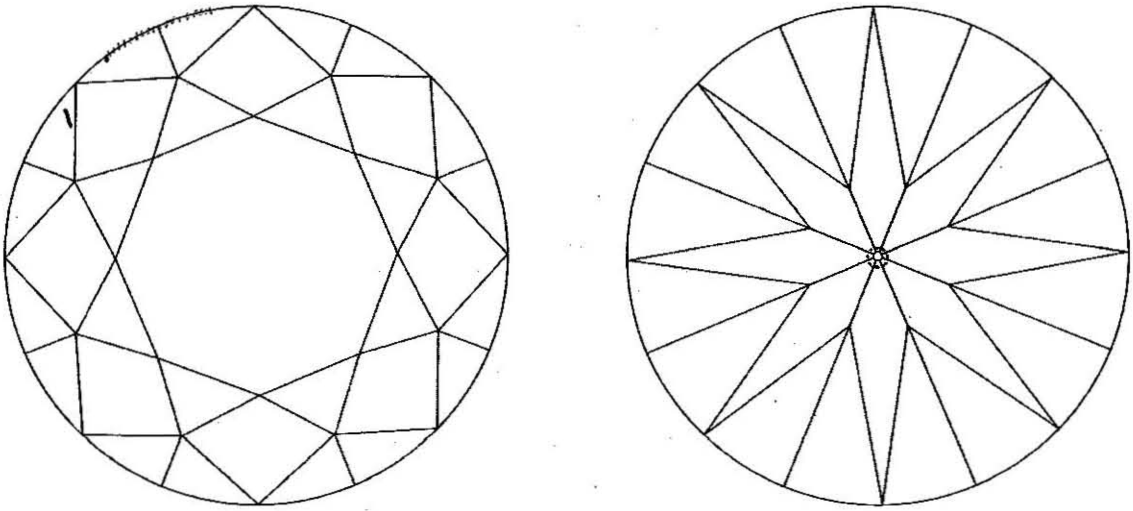


FIG. 12 A MINOR SCRATCH, A PITTED GIRDLE AND A SLIGHTLY ABRADED CULET

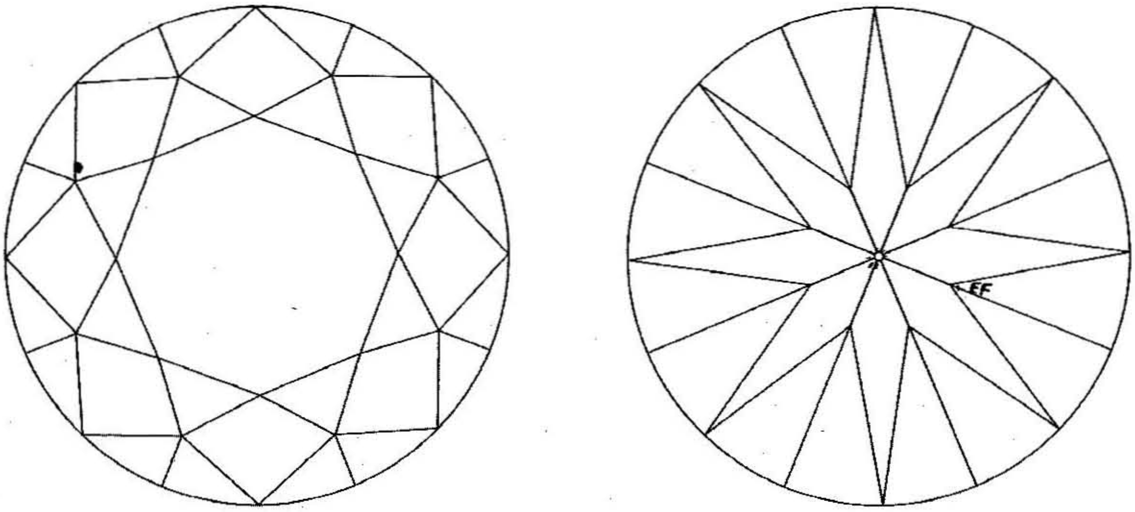


FIG. 13 A MINOR PIT, A MINOR EXTRA FACET AND A SLIGHTLY ROUGH CULET

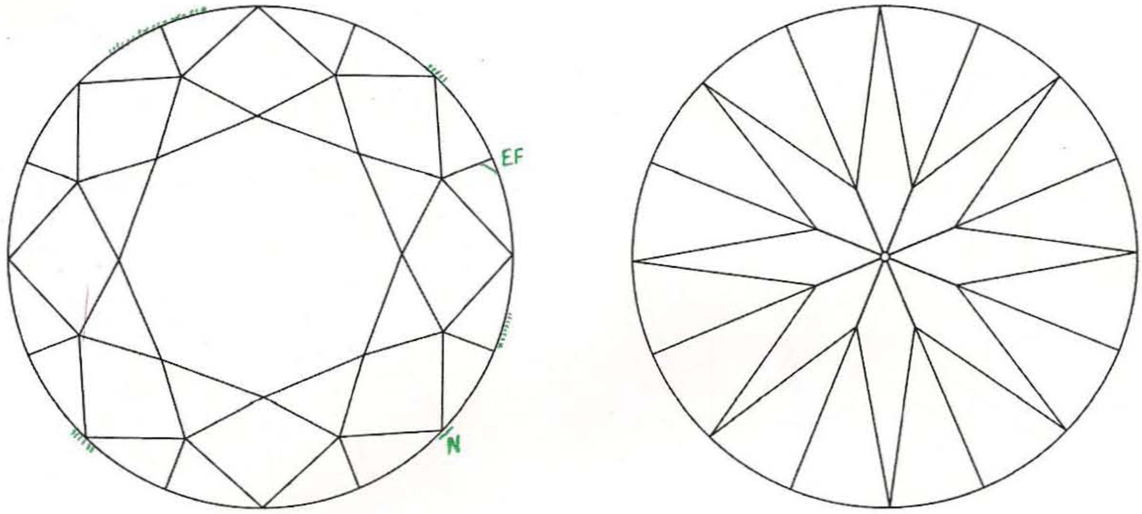


FIG. 14 A NATURAL, A PITTED GIRDLE AND A MINOR EXTRA FACET

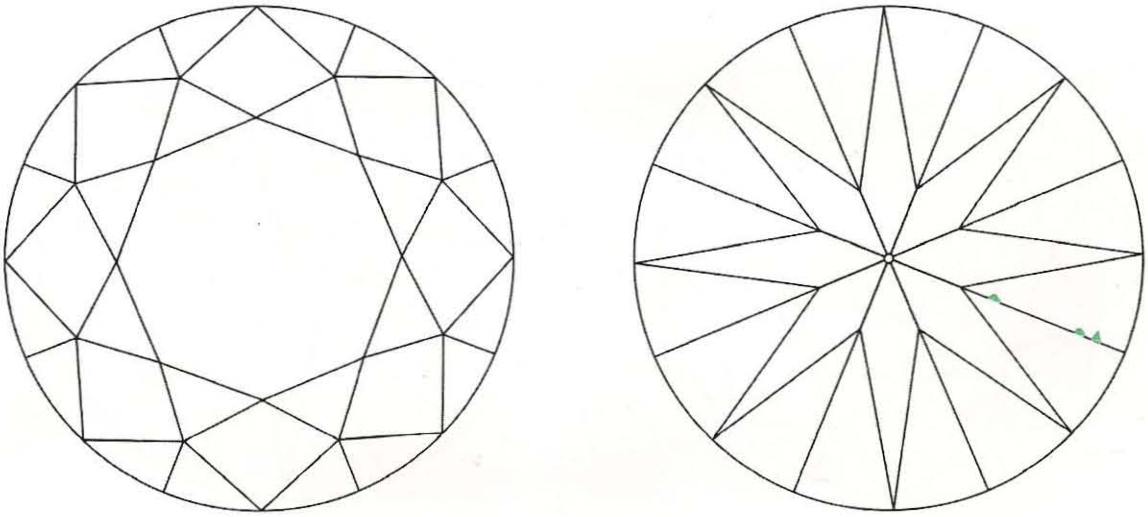


FIG. 15 MINOR PITS

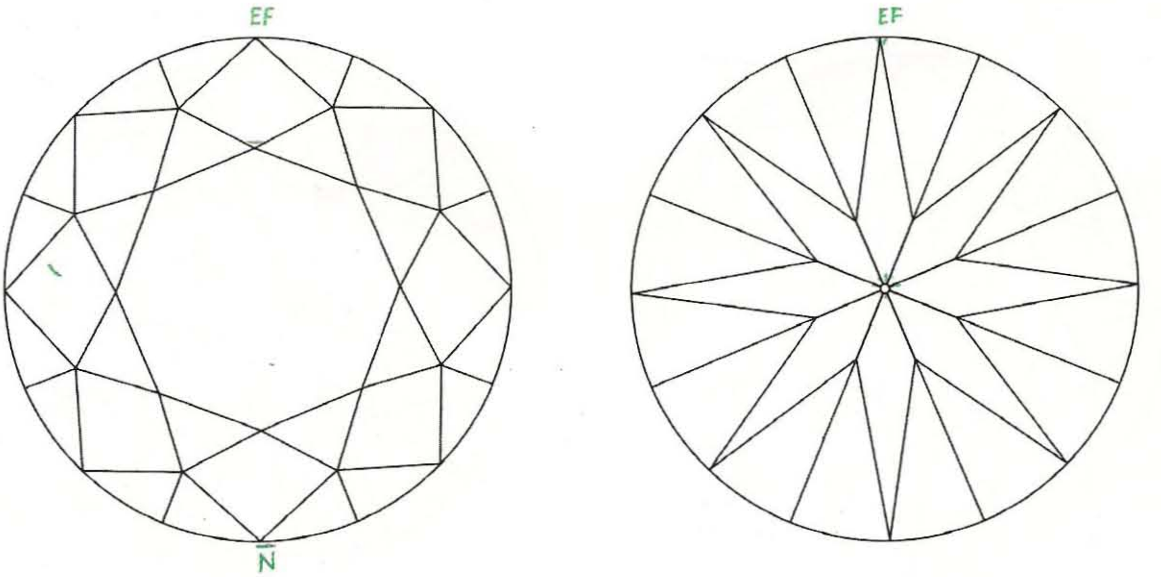


FIG. 16 A MINOR SCRATCH, MINOR EXTRA FACETS, A SMALL NATURAL AND A SLIGHTLY ROUGH CULET

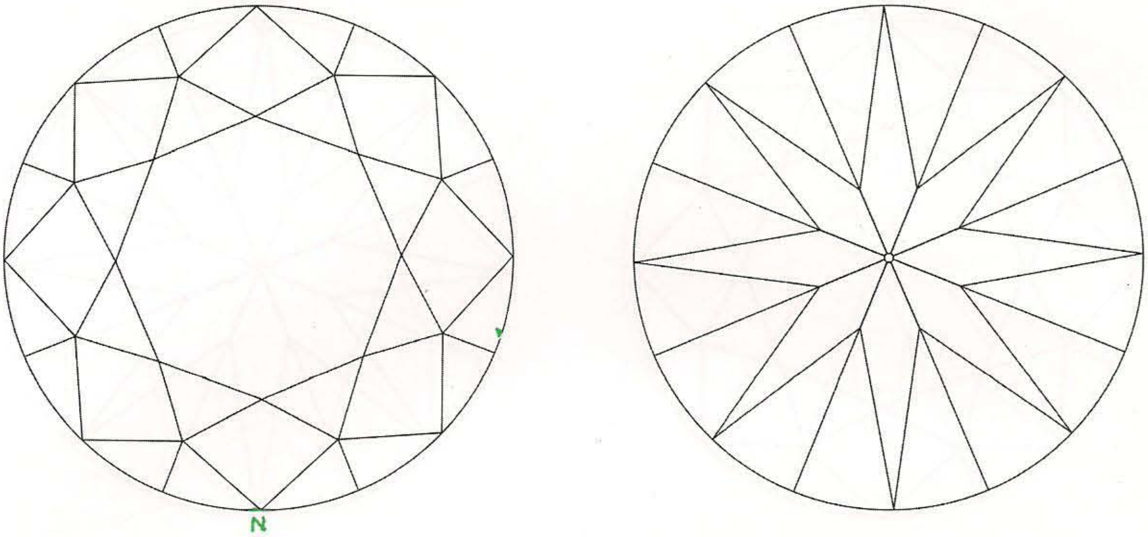


FIG. 17 A MINOR GIRDLE NICK AND A SMALL NATURAL

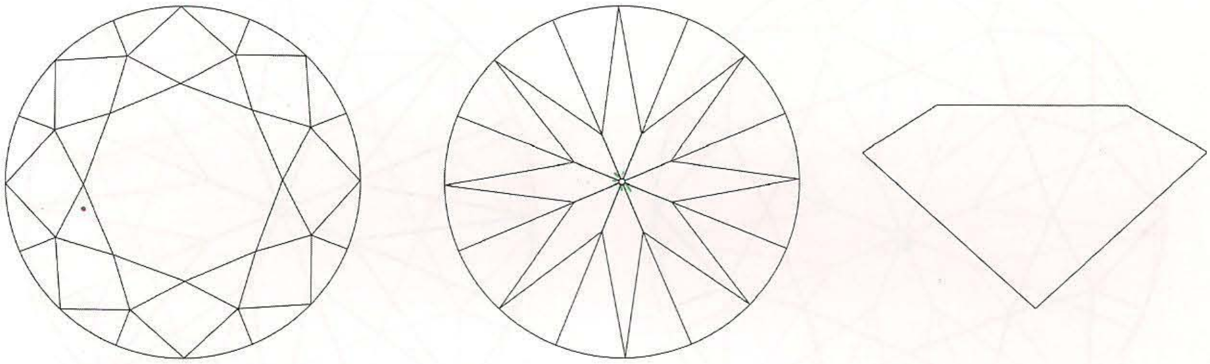


FIG. 18 A PINPOINT OUTSIDE THE TABLE AND A SLIGHTLY ROUGH CULET

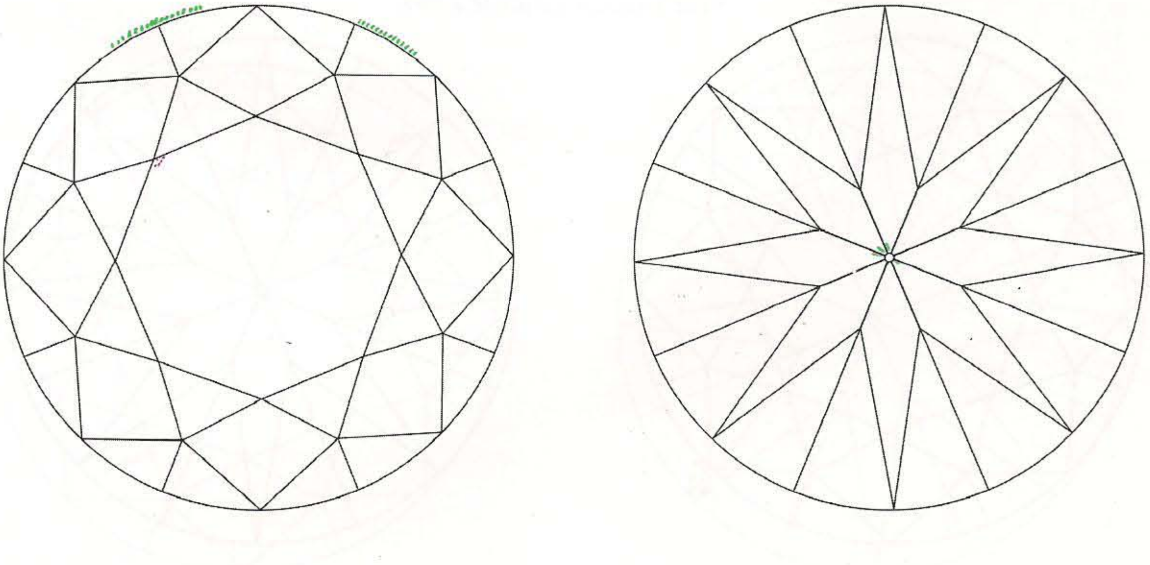


FIG. 19 SMALL GROUPS OF MINUTE PINPOINTS, A PITTED GIRDLE AND A SLIGHTLY ROUGH CULET

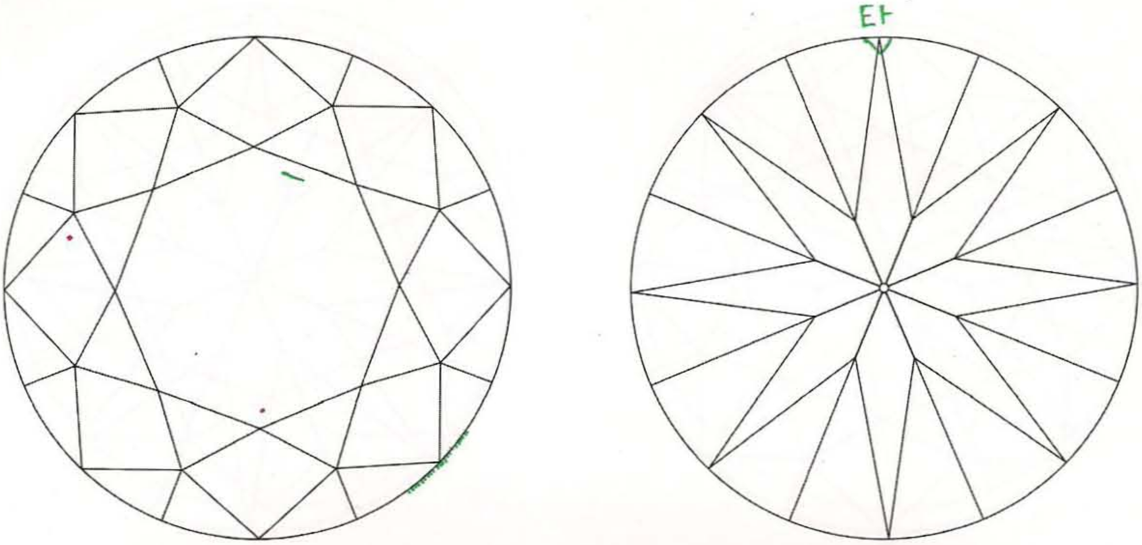


FIG. 20 A MINUTE PINPOINT, A PINPOINT OUTSIDE THE TABLE, A SMALL SCRATCH, A PITTED GIRDLE AND A SMALL EXTRA FACET

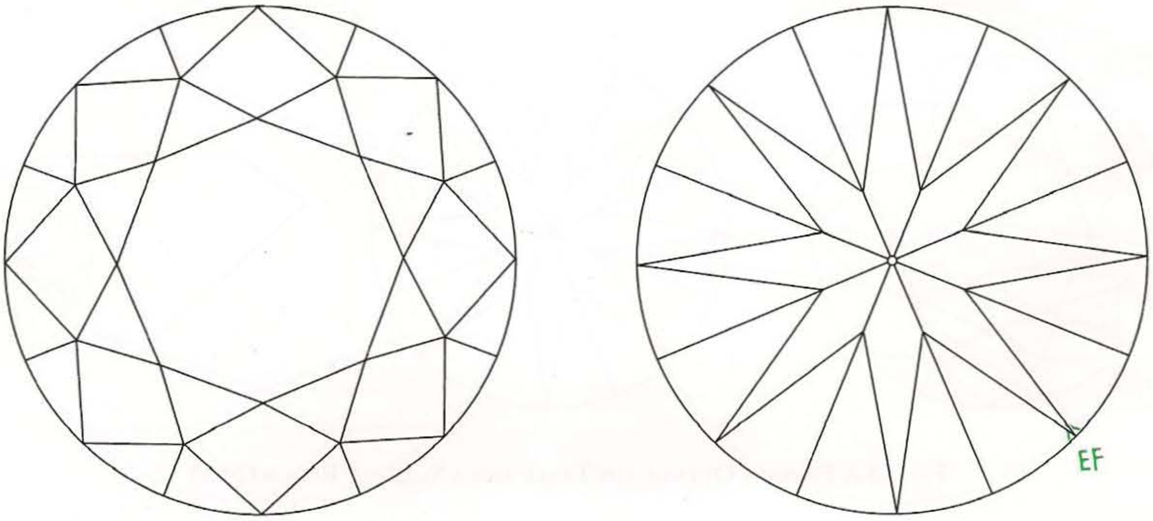


FIG. 21 A MINUTE PINPOINT SMALL EXTRA FACET

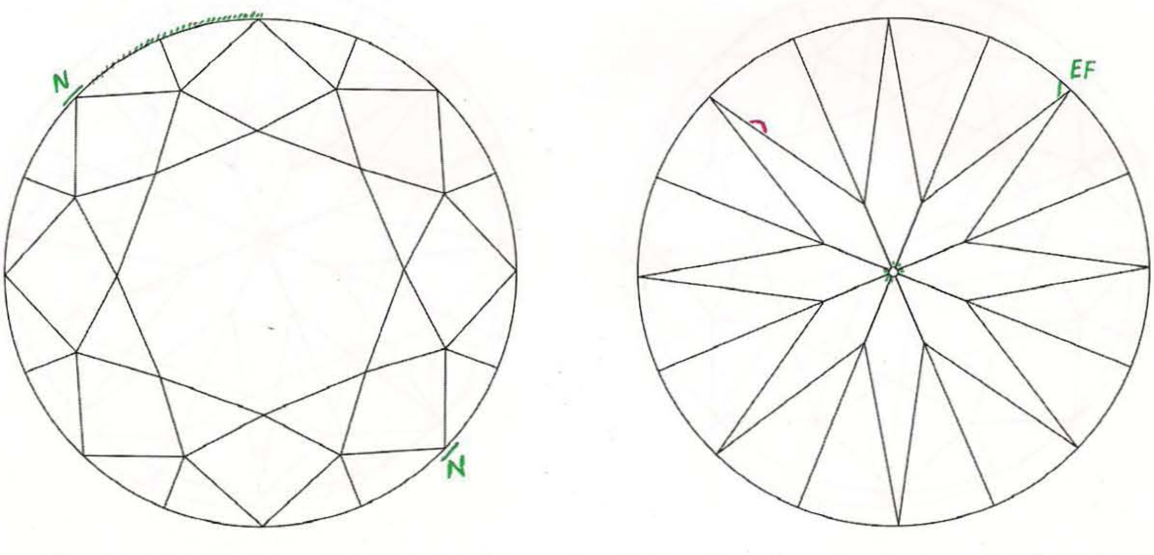


FIG. 22 A MINOR NATURAL, A NATURAL, A PITTED, A TINY FEATHER NOT VISIBLE FROM ABOVE, A SMALL EXTRA FACET AND A SLIGHTLY ROUGH CULET

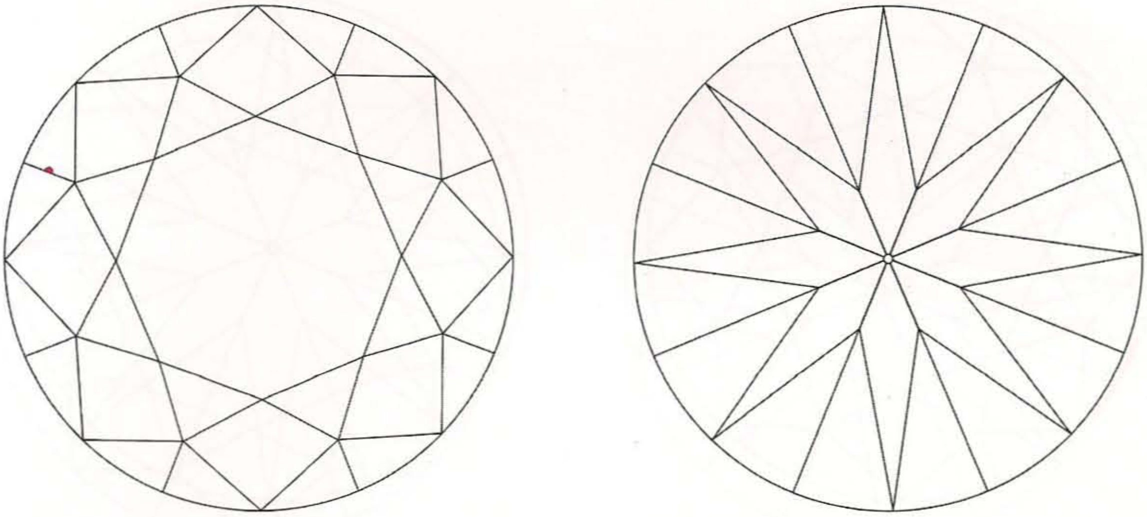


Fig. 23 A Minute Colourless Crystal under a Facet Edge

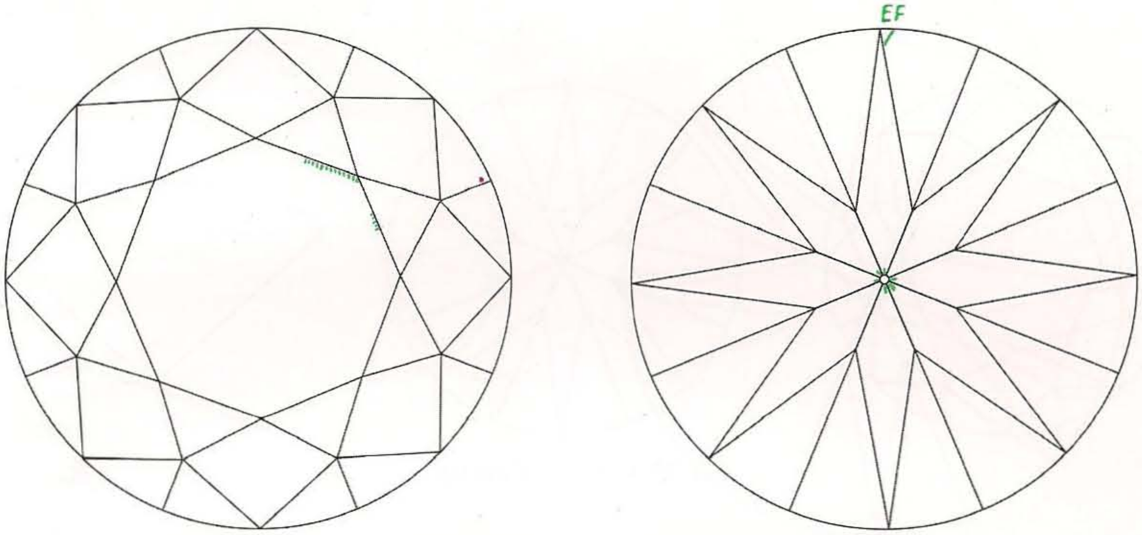


Fig. 24 A Pinpoint Outside the Table, Roughness on the Facet Edges, a Small Extra Facet and a Slightly Rough Culet

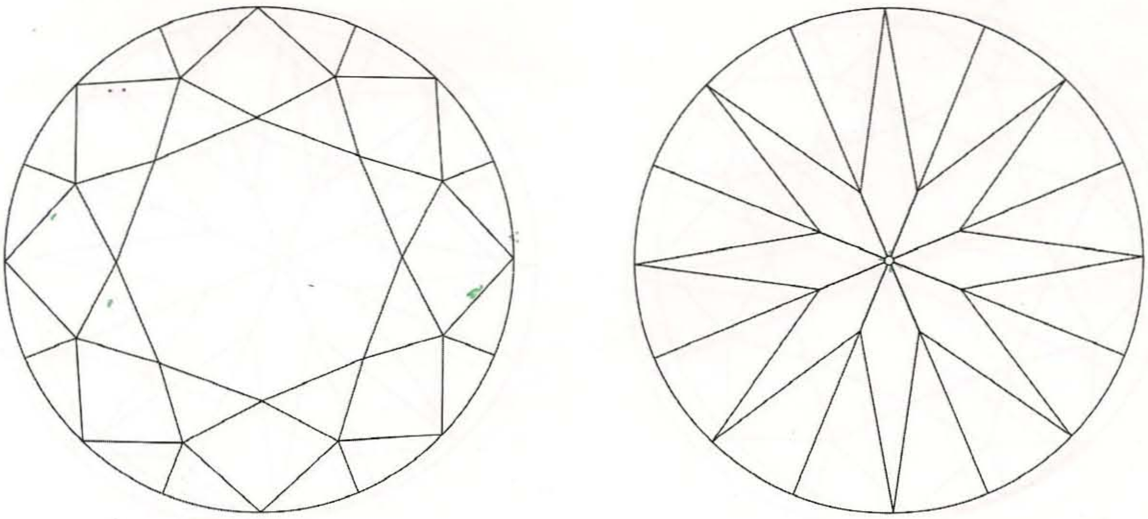


Fig. 25 Minute Pinpoints, a Minute Nick, Small Scratches and a Slightly Abraded Culet

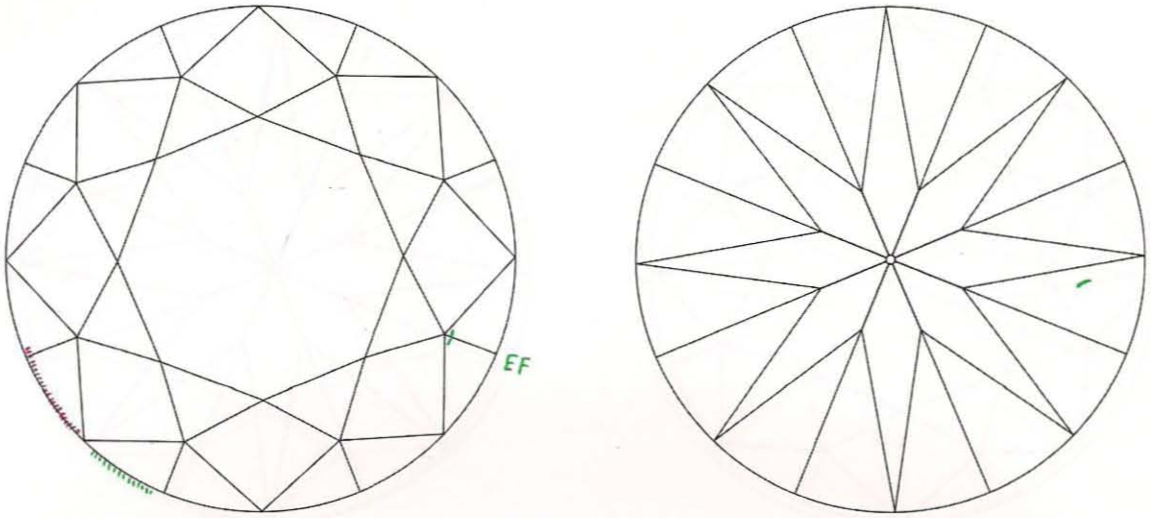


FIG. 26 MINOR GIRDLE BEARDING, A PITTED GIRDLE, A SMALL SCRATCH AND A MINOR EXTRA FACET

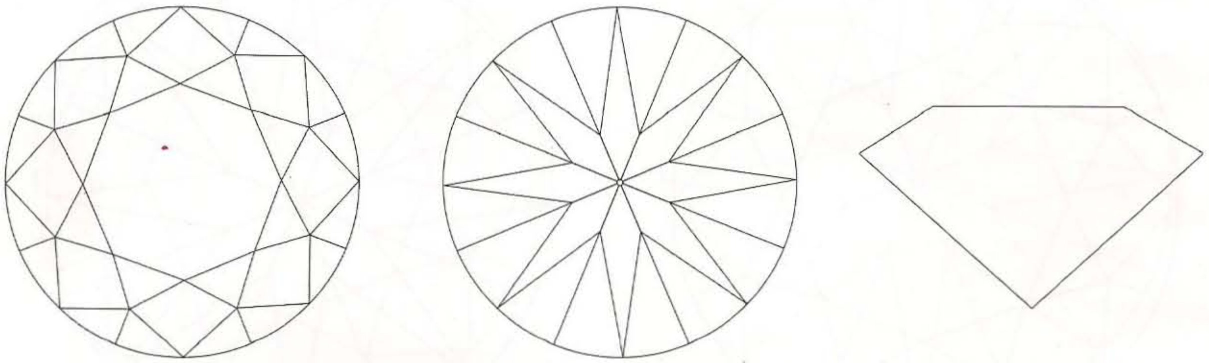


FIG. 27 A MINUTE CRYSTAL

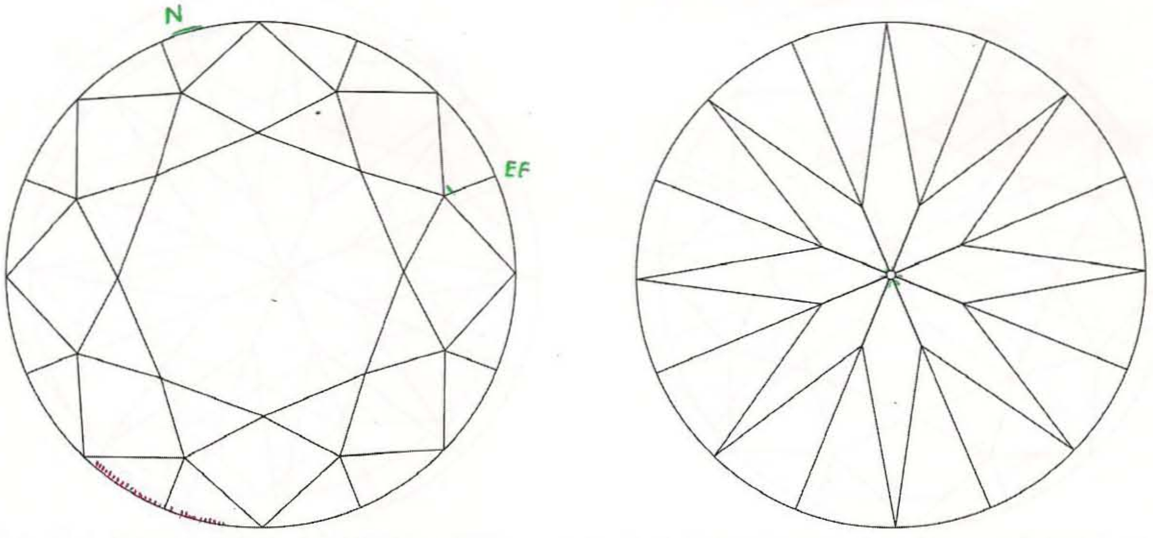


FIG. 28 CLEARLY VISIBLE BEARDING A NATURAL, A MINOR EXTRA FACET AND A SLIGHTLY ABRADED CULET

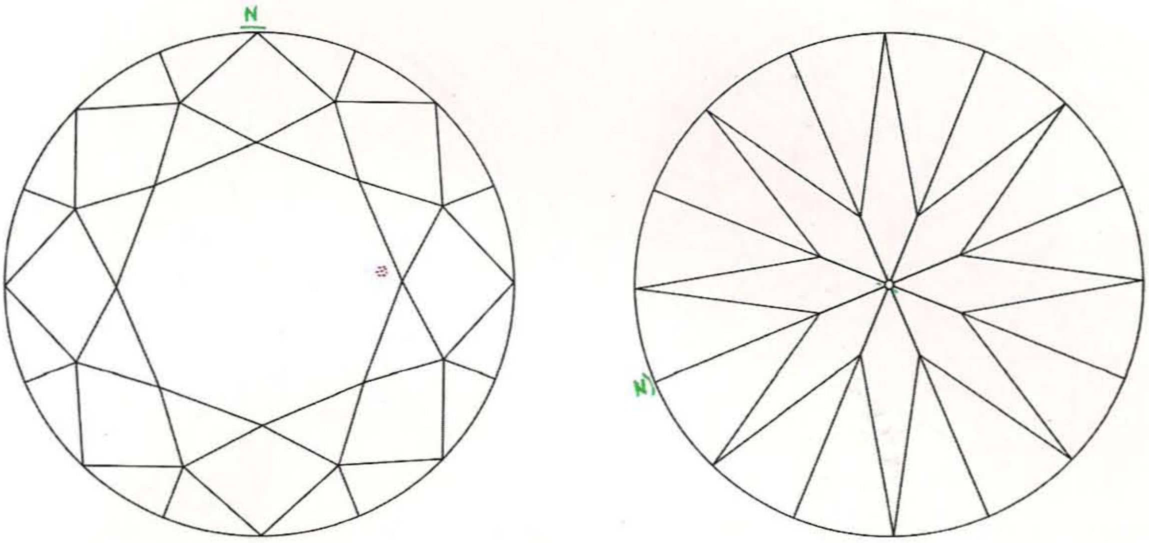


Fig. 29 Small Group of Minor Pinpoints, a Nick, a Minor Natural, a Natural and a Slightly Rough Culet

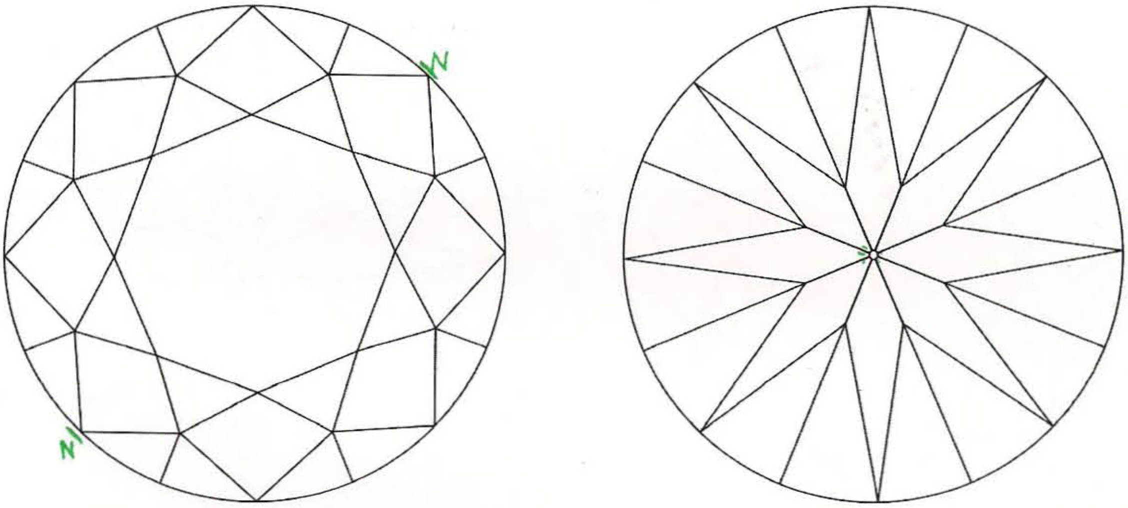


Fig. 30 A Minor Pinpoint, a Minor Cleavage Visible Only from Below, Minor Naturals and a Slightly Rough Culet

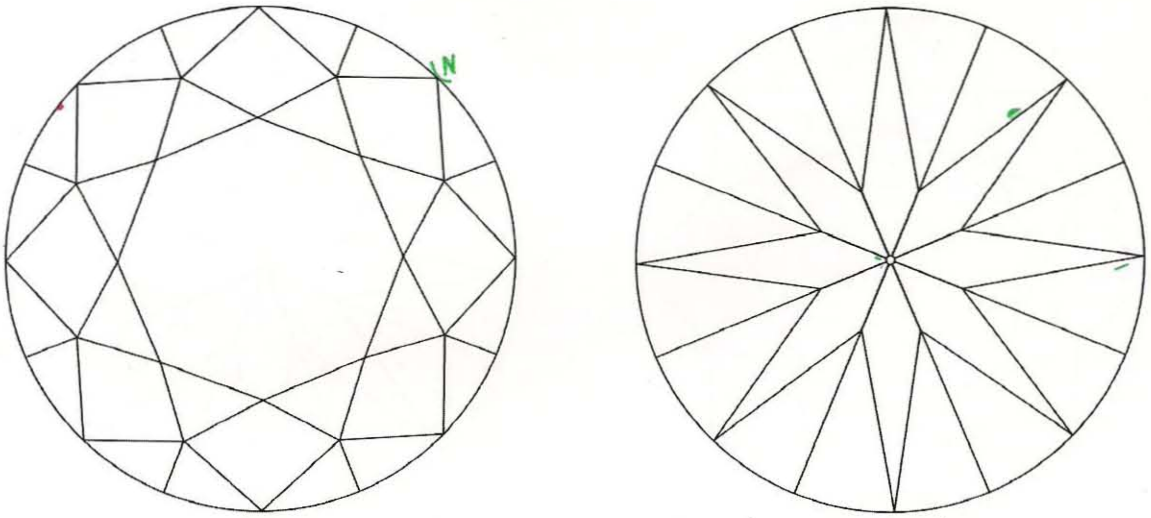


Fig. 31 A Minor Crystals, a Naturals, a Minor Pit, a Small Scratch and a Slightly Rough Culet

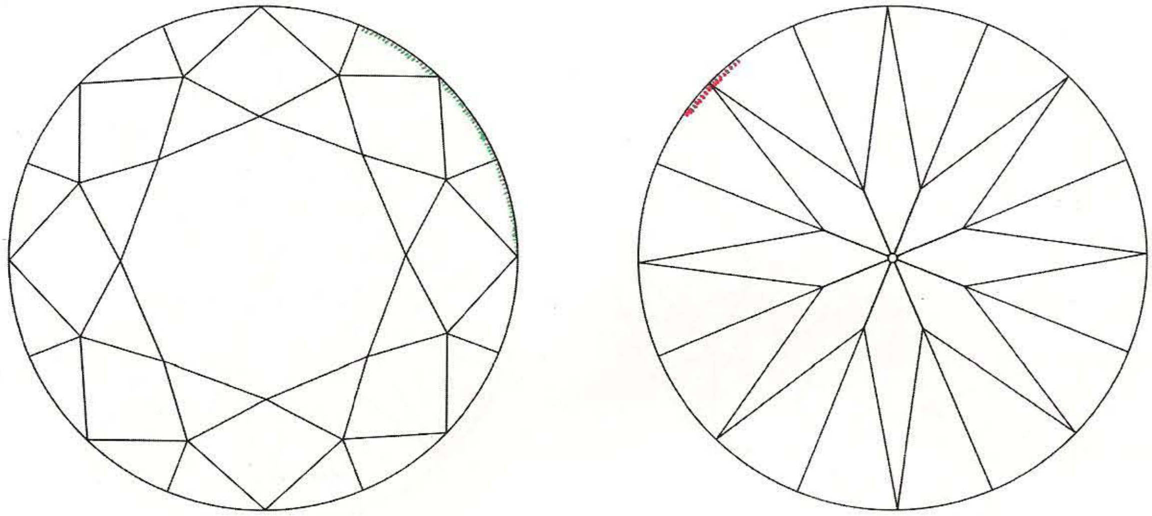


FIG. 32 BEARDING VISIBLE ONLY FROM BELOW AND A PITTED GIRDLE

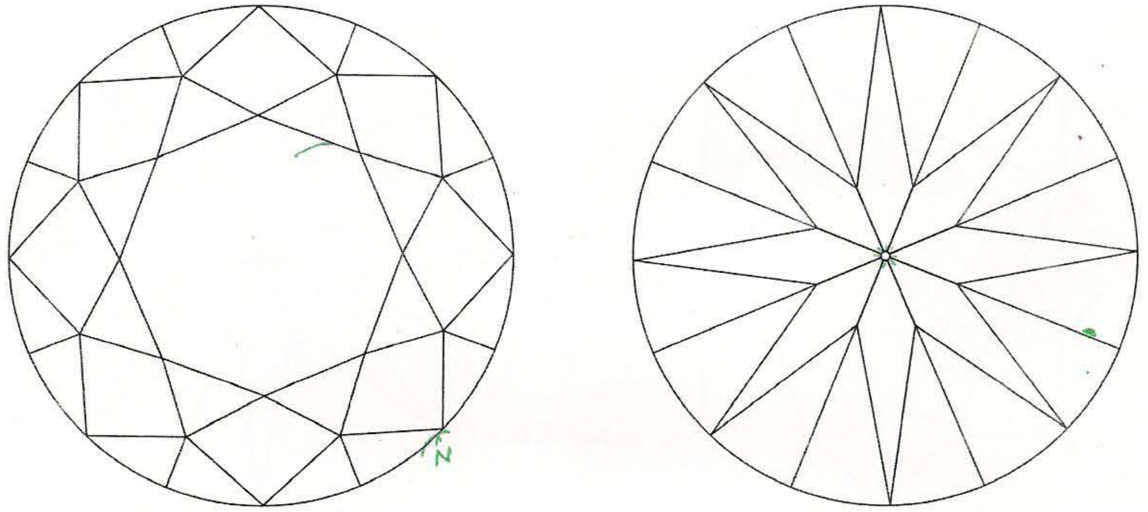


FIG. 33 A DISTINCTLY INDENTED NATURAL WITH MINOR NICKS, A SCRATCH, A PIT AND A ROUGH CULET

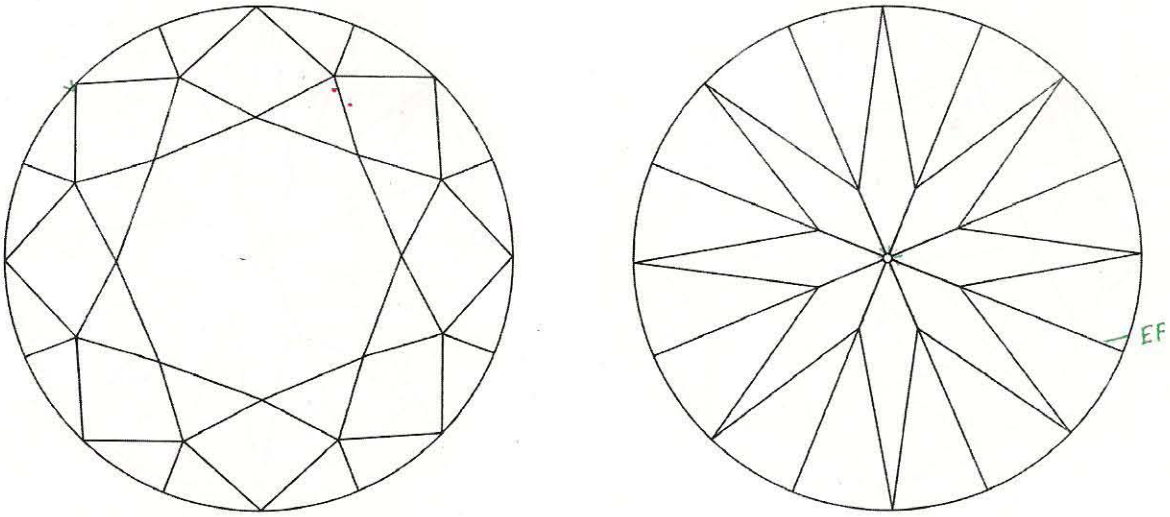


FIG. 34 PINPOINTS, A SMALL NICK, AN EXTRA FACET AND A ROUGH CULET

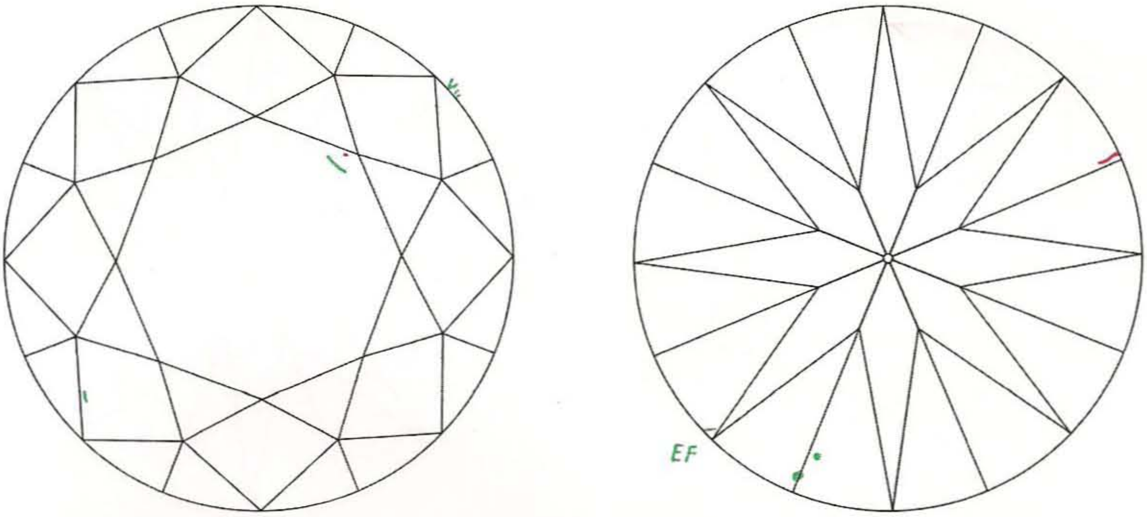


FIG. 35 A MINOR CRYSTAL, SMALL NICKS, SCRATCHES, PITS, AN EXTRA FACET AND A MINOR CLEAVAGE UNDER A FACET EDGE VISIBLE ONLY FROM BELOW

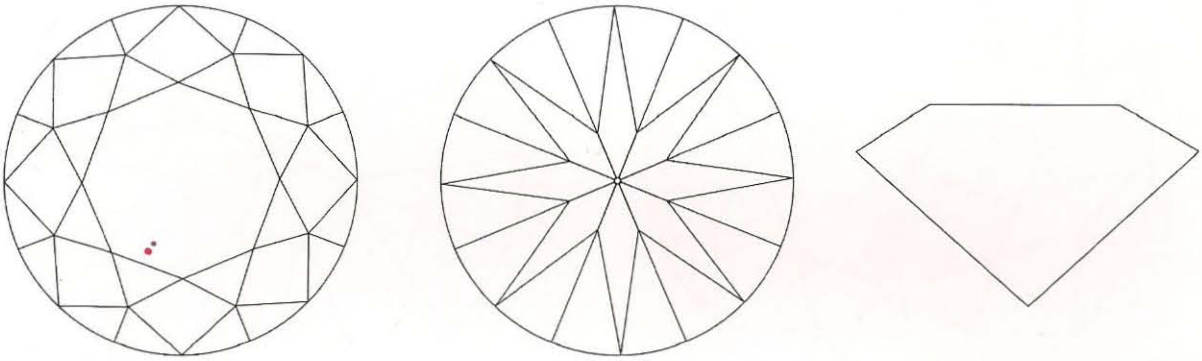


FIG. 36 MINUTE CRYSTALS VERY CLOSE TO THE TABLE SURFACE

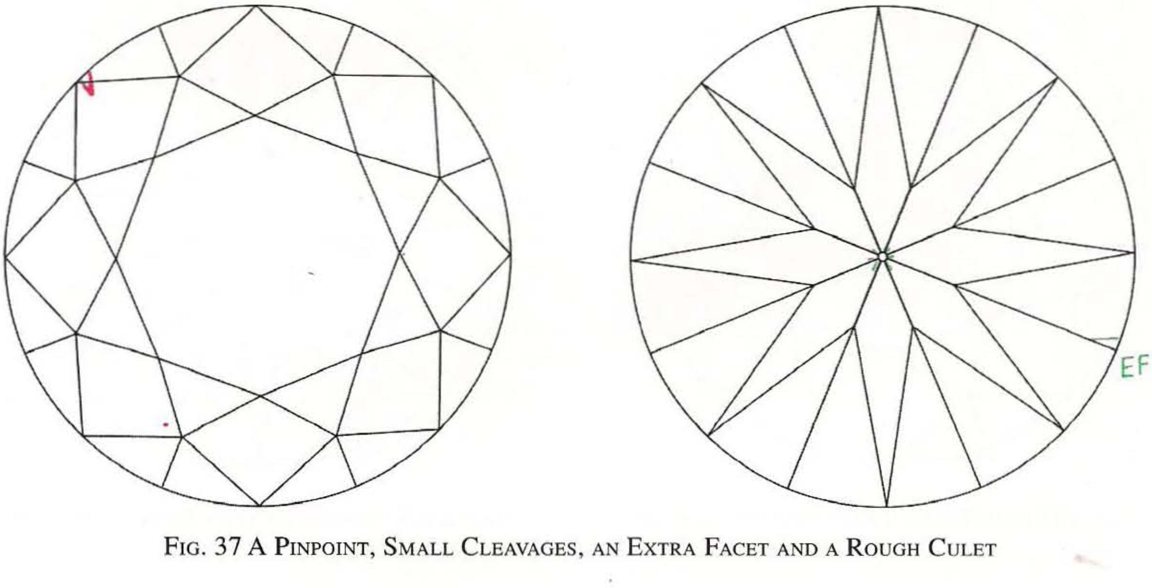


FIG. 37 A PINPOINT, SMALL CLEAVAGES, AN EXTRA FACET AND A ROUGH CULET

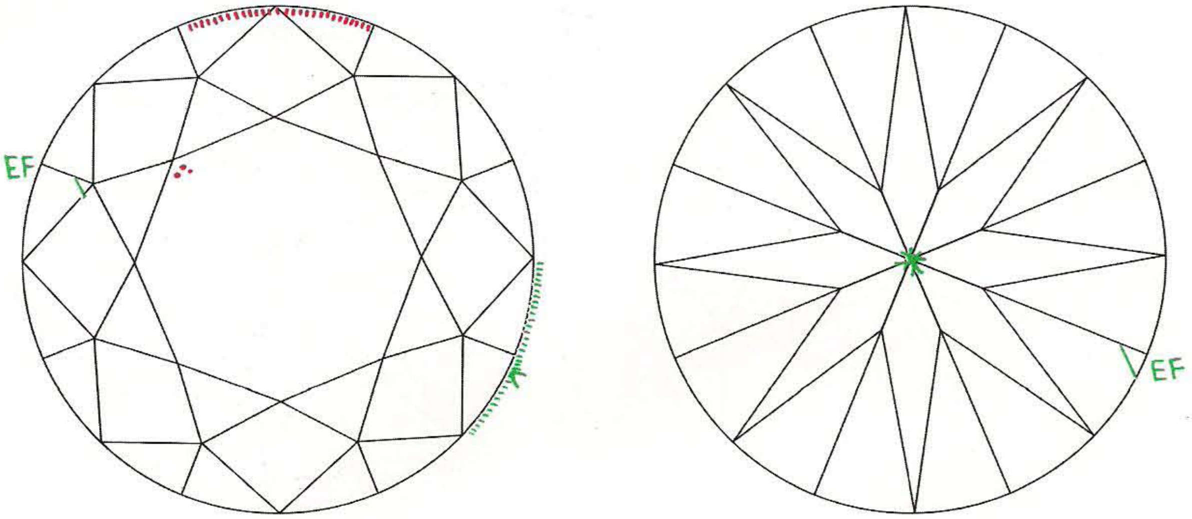


FIG. 38 PINPOINTS, BEARDING, A PITTED GIRDLE, A GIRDLE NICK, MINOR EXTRA FACETS AND A ROUGH CULET

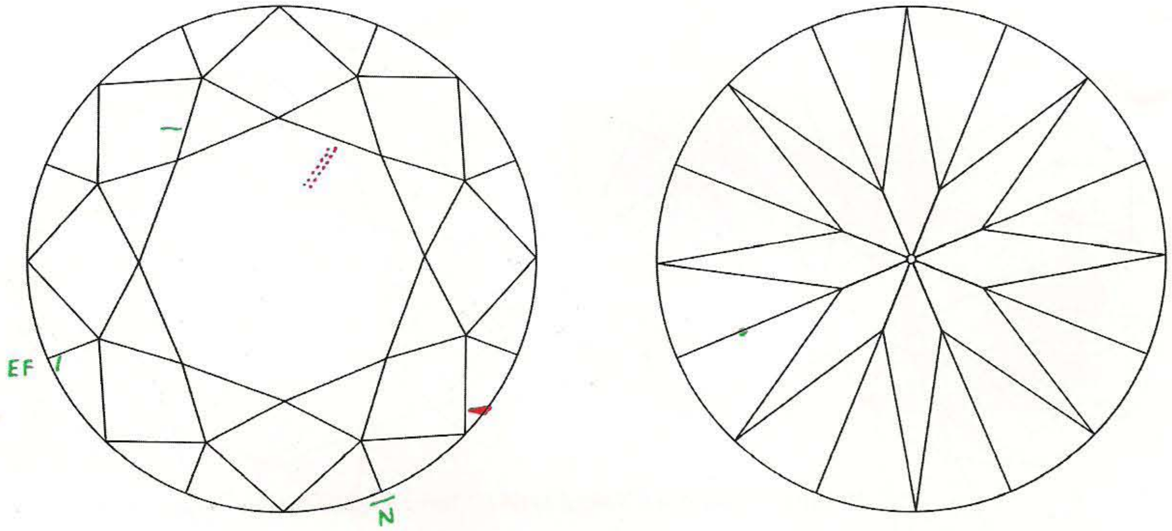


FIG. 39 MINOR CLEAVAGES, A SMALL CRYSTAL UNDER A FACET EDGE, GROWTH LINES, A SCRATCH, A MINOR NATURAL, AN EXTRA FACET AND A PIT

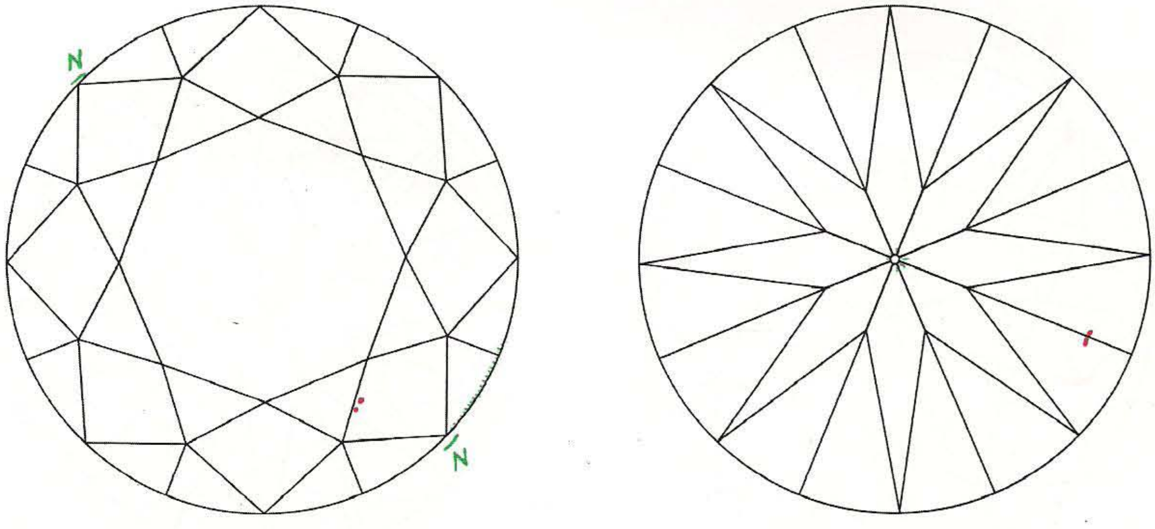


FIG. 40 SMALL CRYSTALS UNDER A FACET EDGE, A SMALL CLEAVAGE VISIBLE ONLY FROM BELOW, A PITTED GIRDLE, MINOR NATURALS AND ABRADED CULET

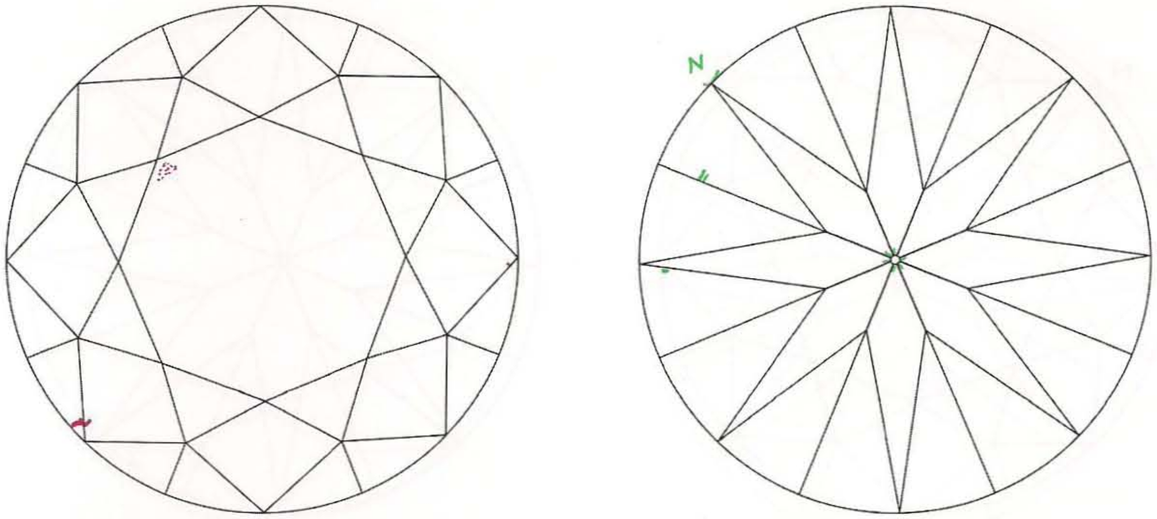


Fig. 41 A Group of Pinpoints, Small Cleavages, a Minute Crystal, a Natural, Scratches and an Abraded Culet

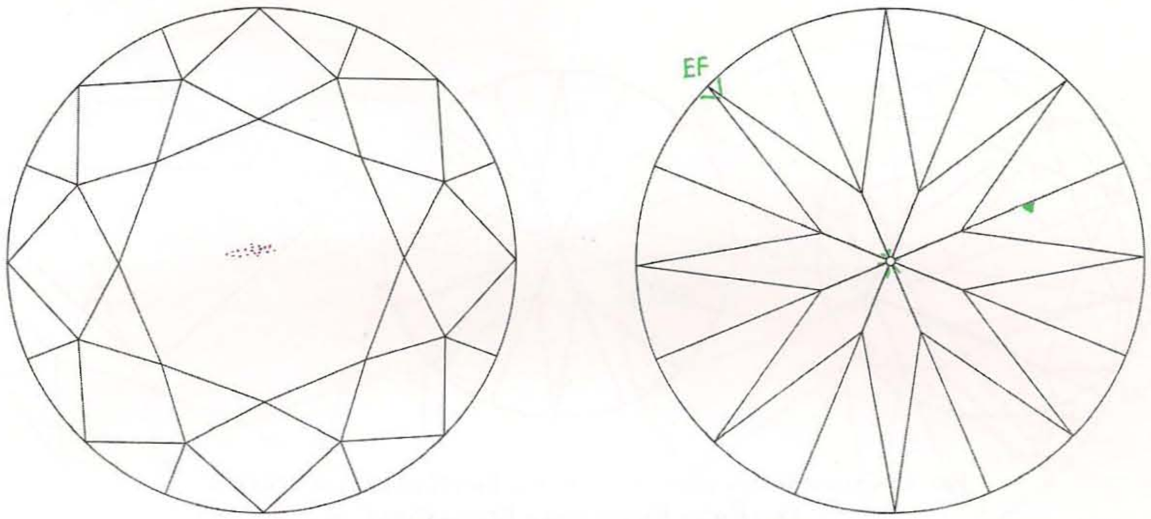


Fig. 42 A Group of Pinpoints, a Pit, an Extra Facet and a Rough Culet

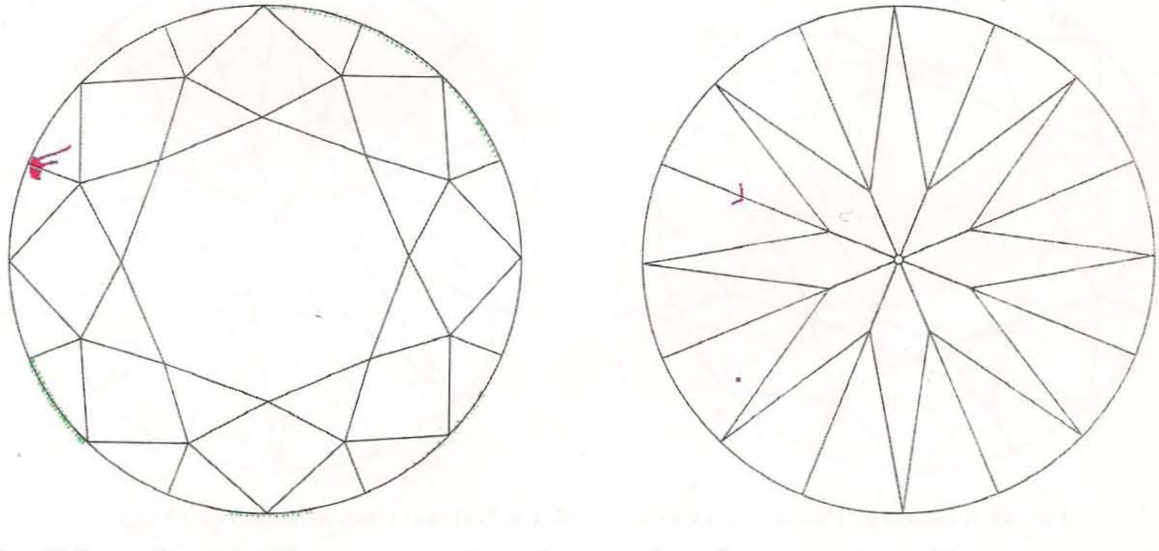


Fig. 43 Small Cleavages Partly under a Facet Edge and Only Some of which are Visible from Above, a Minor Crystal and Areas of Girdle Roughness

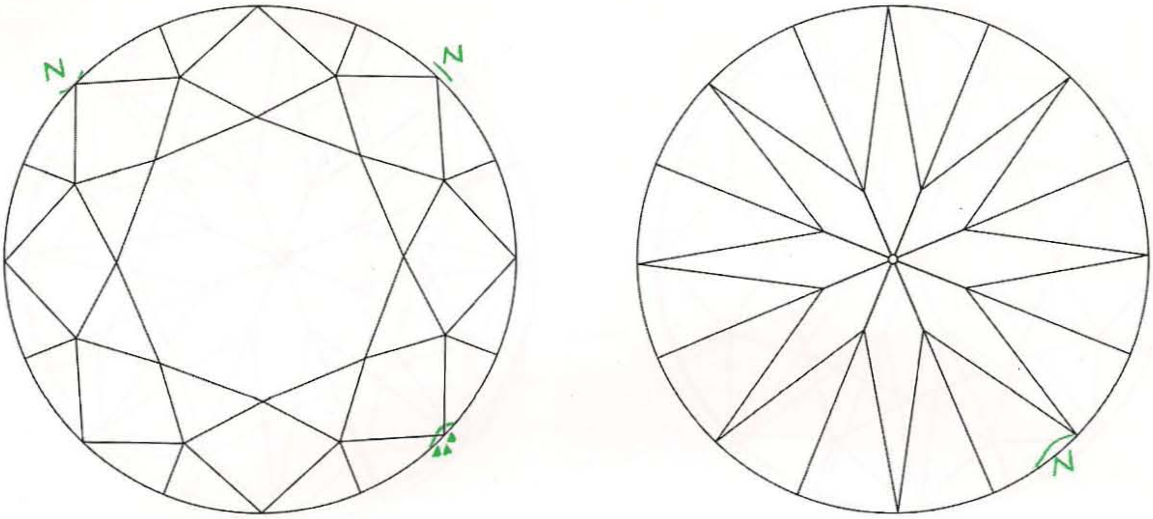


FIG. 44 PINPOINTS, A MINOR NATURAL AND AN INDENTED NATURAL WITH TRIGONS

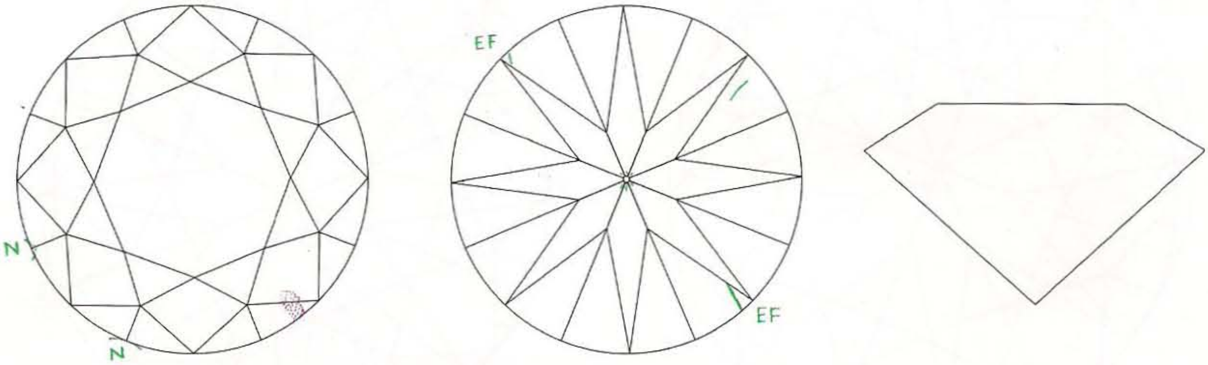


FIG. 45 CLOUD SURROUNDING A CLEAVAGE, TWO NATURALS, A SCRATCH, TWO EXTRA FACETS AND A ROUGH CULET

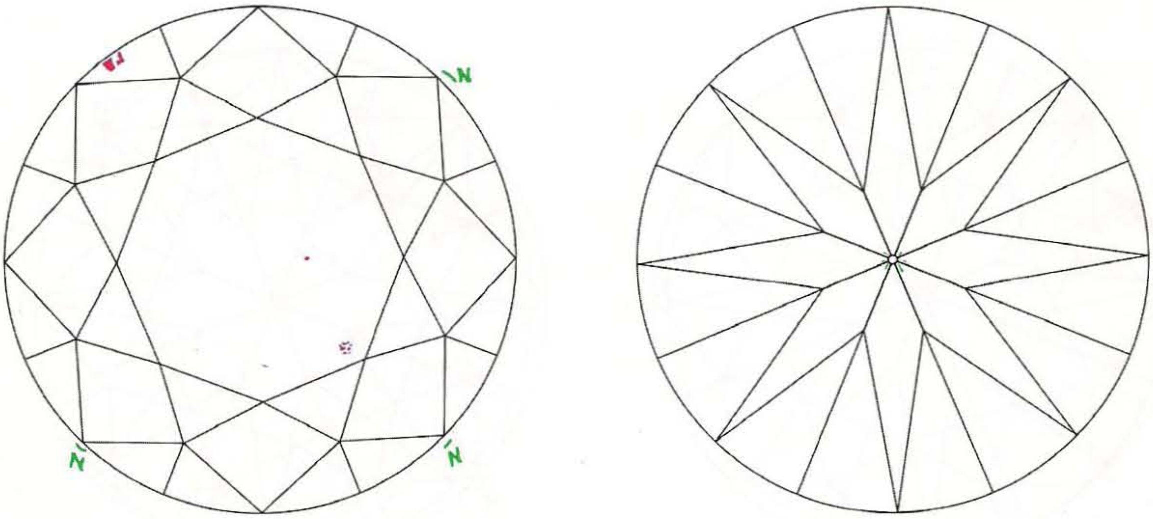


FIG. 46 A GROUP OF PINPOINTS, A CLEAVAGE, MINOR NATURALS AND AN ABRADED CULET

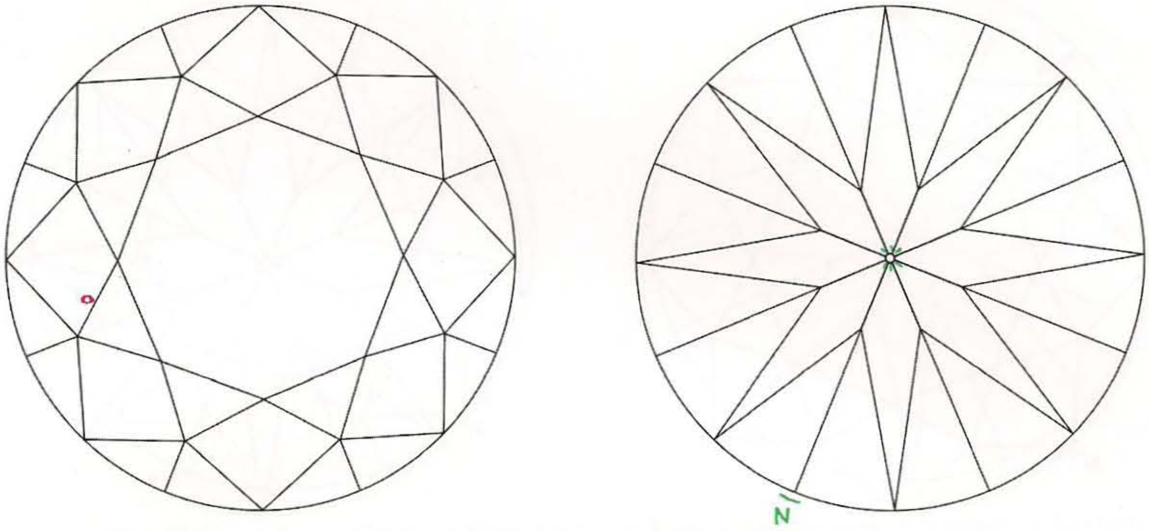


FIG. 47 A CRYSTAL, A MINOR NATURAL AND A ROUGH CULET

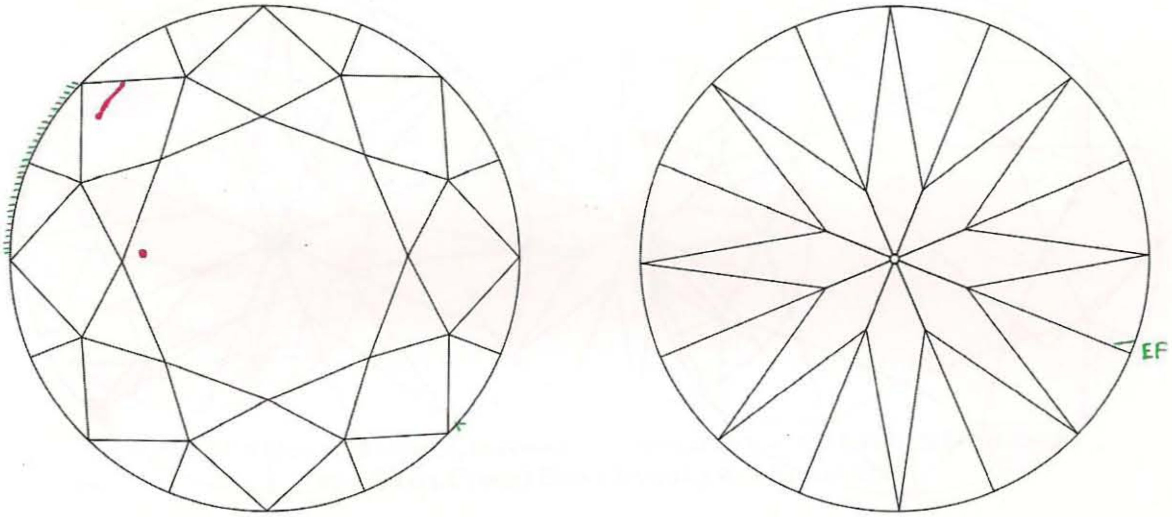


FIG. 48 A SMALL CRYSTAL, A CLEAVAGE, A SMALL GIRDLE NICK, AREAS OF GIRDLE ROUGHNESS AND AN EXTRA FACET

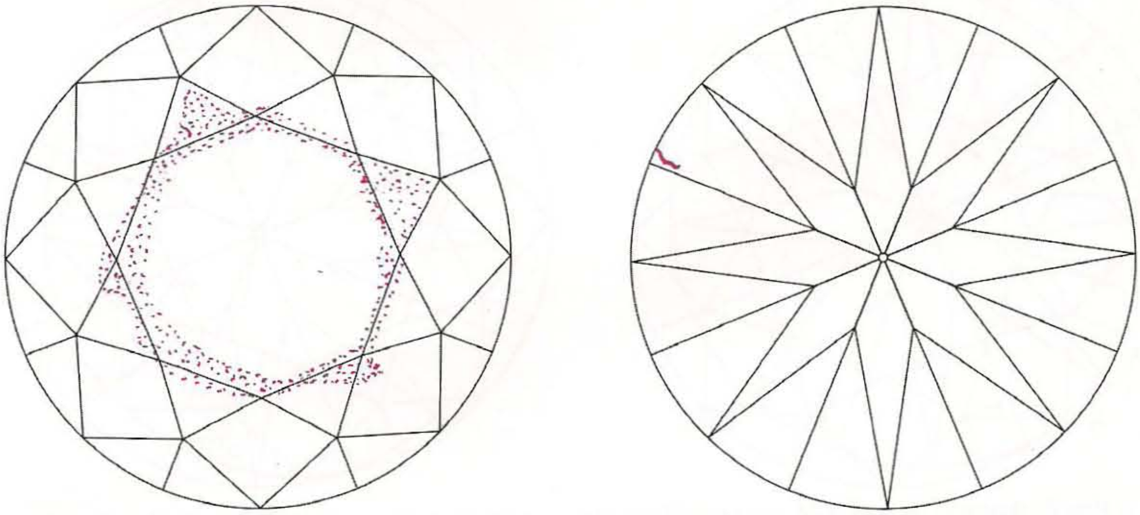


FIG. 49 HARDLY VISIBLE CLOUD AREAS AND A FEATHER UNDER A FACET EDGE

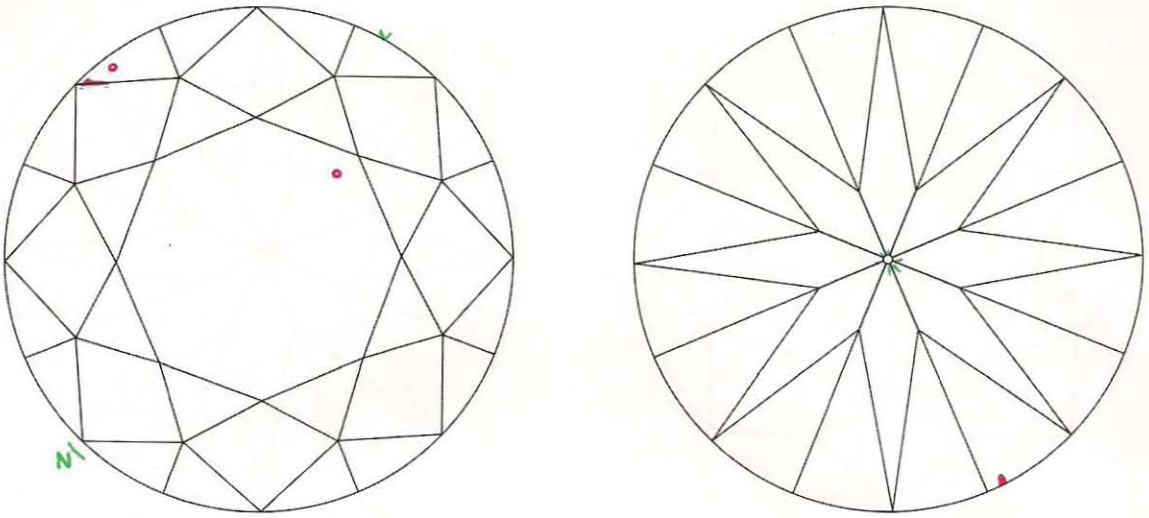


FIG. 50 A SMALL CRYSTAL, A GROUP OF PINPOINTS, SMALL CLEAVAGES, A GIRDLE NICK, A MINOR NATURAL AND A ROUGH CULET

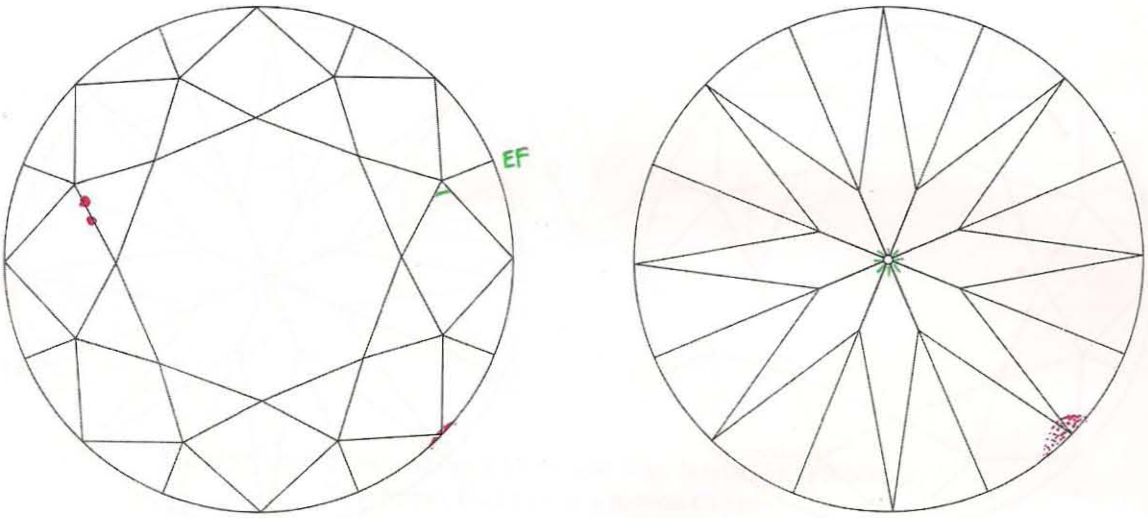


FIG. 51 SMALL CRYSTALS OUTSIDE THE TABLE, A SMALL GIRDLE CLEAVAGE, A CLOUD, AN EXTRA FACET AND AN ABRADED

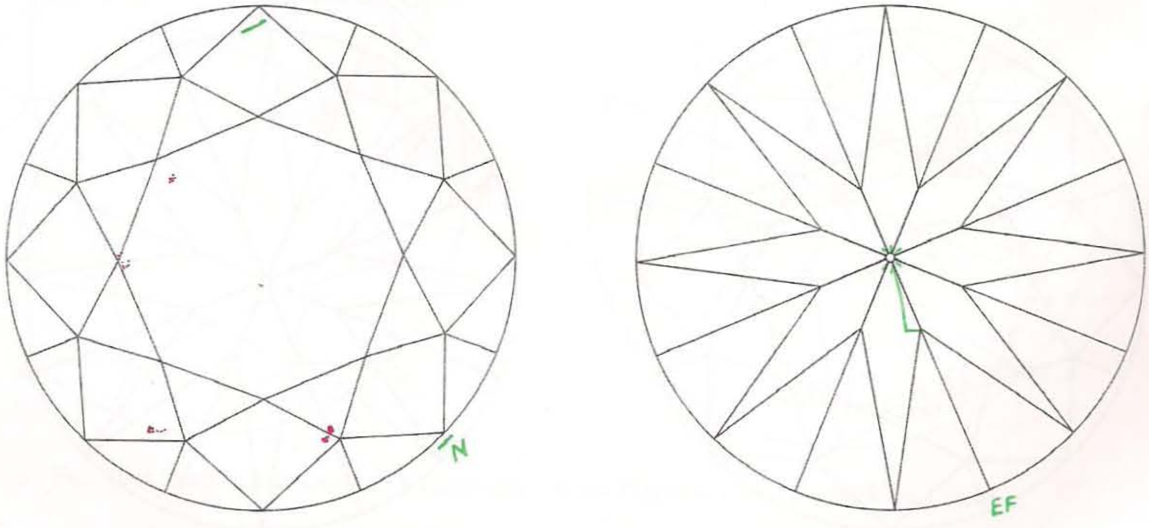


FIG. 52 SMALL GROUPS OF PINPOINTS, MINOR CRYSTALS, A MINOR NATURAL, SCRATCHES, AN EXTRA FACET AND A ROUGH CULET

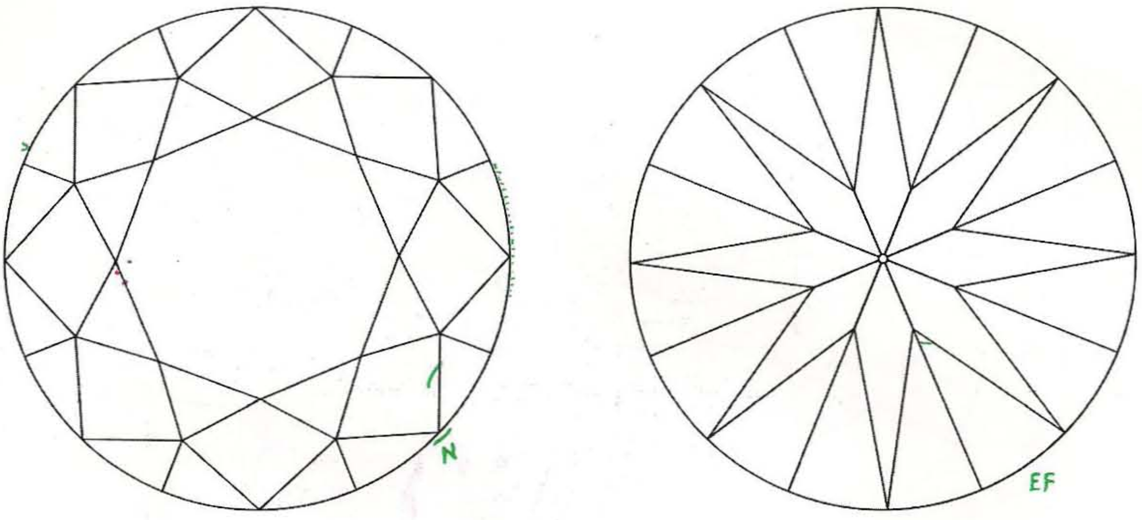


FIG. 53 A GROUP OF SMALL CRYSTALS NEAR THE FACET EDGE, A GIRDLE NICK, A NATURAL, A SCRATCH, AN EXTRA FACET AND A PITTED GIRDLE

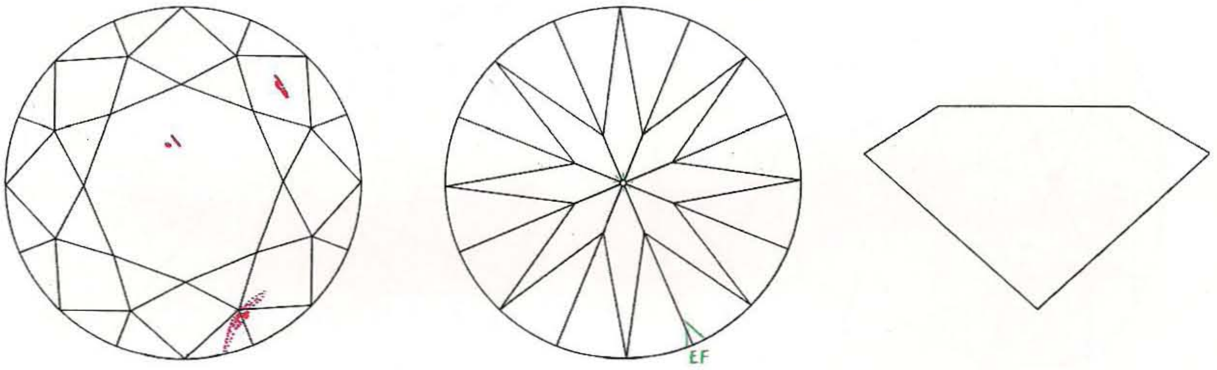


FIG. 54 A SMALL CRYSTAL, CLEAVAGES (ONE REFLECTS AND THE OTHER IS SURROUNDED BY A SMALL CLOUD) EXTRA FACETS AND A ROUGH CULET

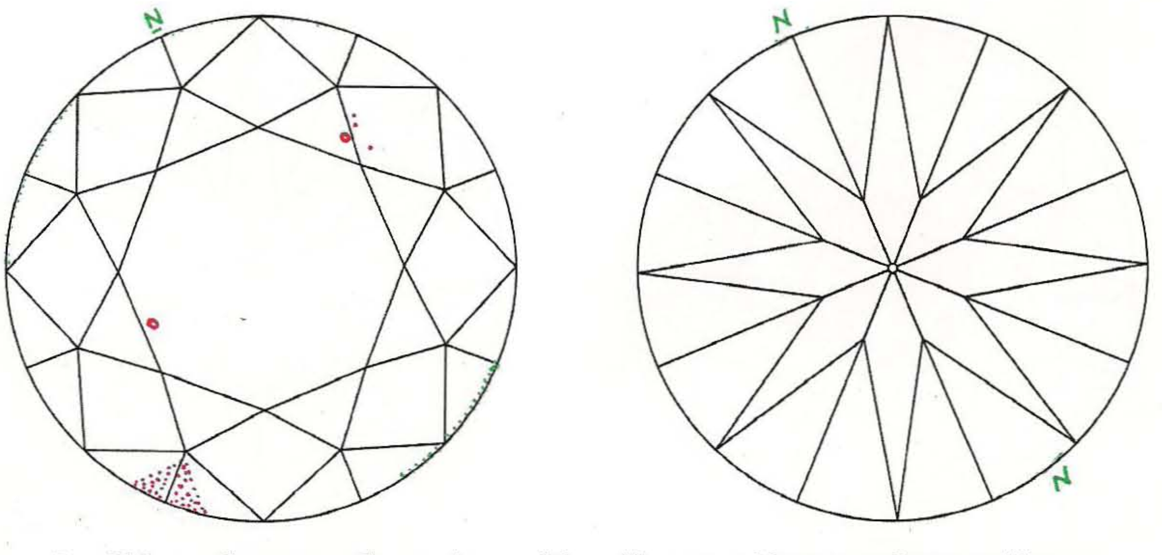


FIG. 55 SMALL CRYSTALS, A CLOUDY AREA, A MINOR NATURAL, A NATURAL AN INDENTED NATURAL AND AREAS OF PITTED GIRDLE

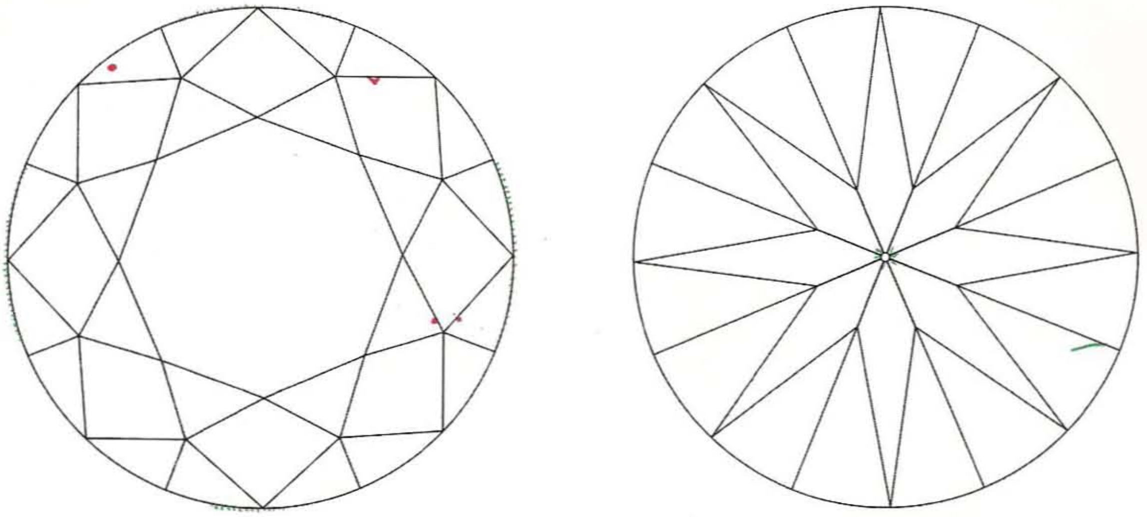


FIG. 56 A DARK INCLUSION AND SEVERAL CRYSTALS, AREAS OF PITTED GIRDLE, A SCRATCH AND AN ABRADED CULET

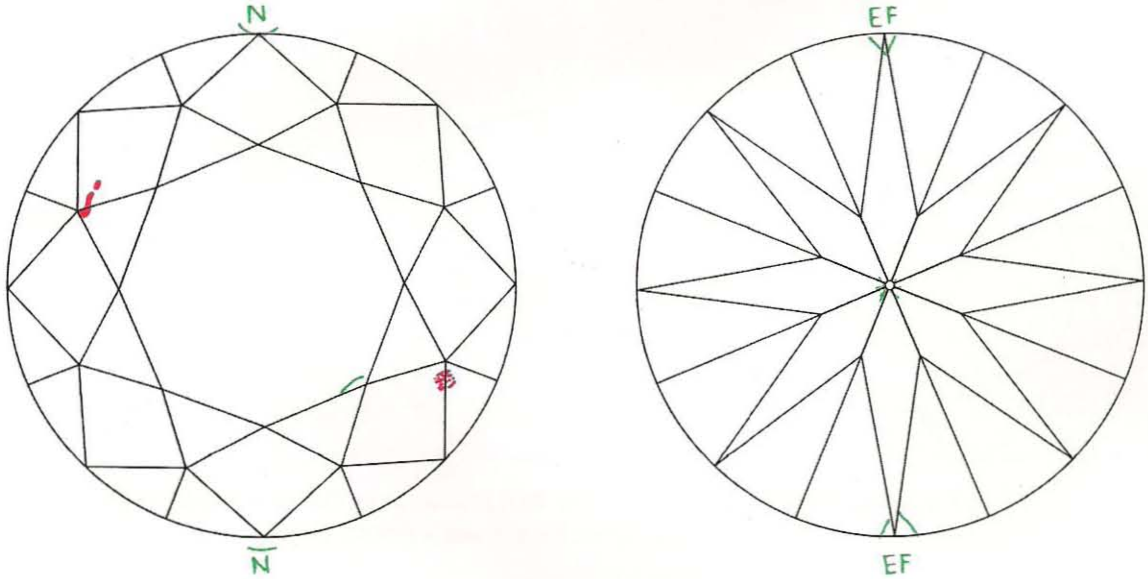


FIG. 57 A CLEAVAGE, A GROUP OF PINPOINTS PARTLY UNDER FACET EDGES, A SCRATCH, EXTRA FACETS, A MINOR NATURAL, A NATURAL AND AN ABRADED CULET

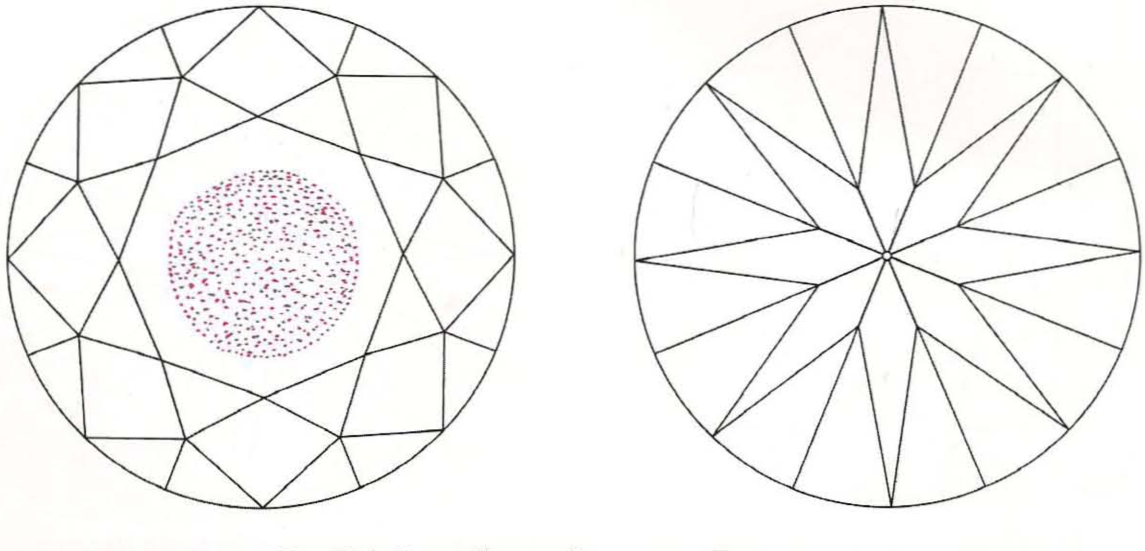


FIG. 58 A CLOUD CAUSING DECREASE IN TRANSPARENCY

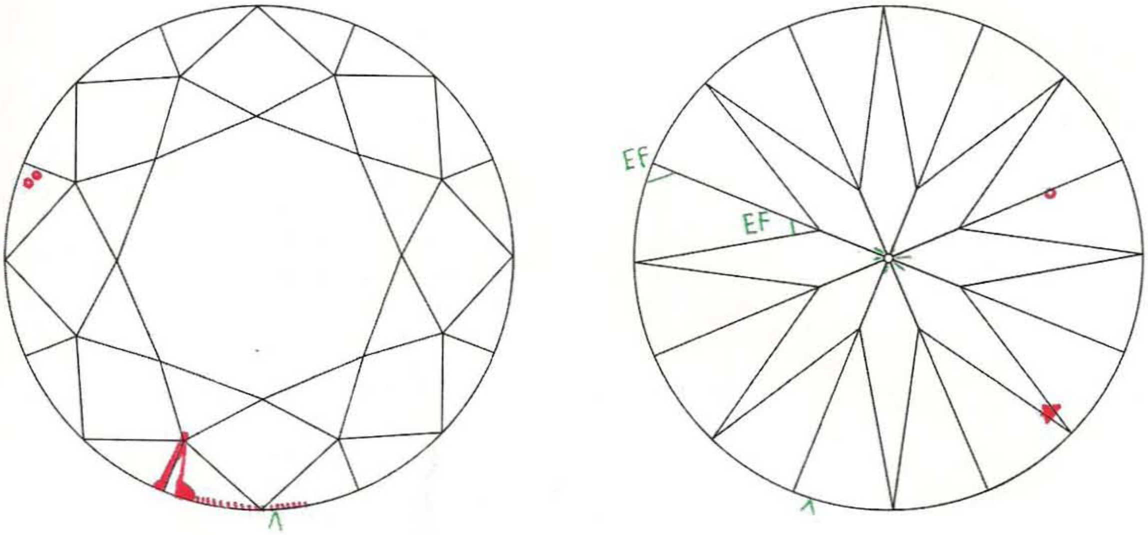


FIG. 59 CRYSTALS, BEARDING, A CLEAVAGE VISIBLE ONLY FROM BELOW, GIRDLE NICKS, A MINOR NATURAL, EXTRA FACETS AND A ROUGH CULET

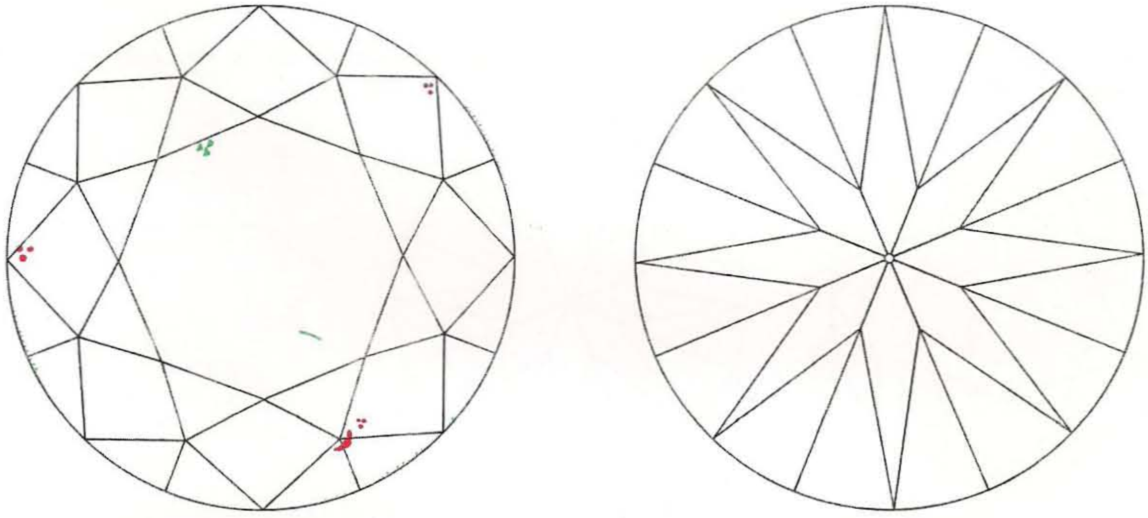


FIG. 60 SMALL GROUPS OF PINPOINTS AND CRYSTALS, MINUTE CAVITIES ON THE TABLE SURFACE, AREAS OF PITTED GIRDLE, A SMALL CLEAVAGE AND A SCRATCH

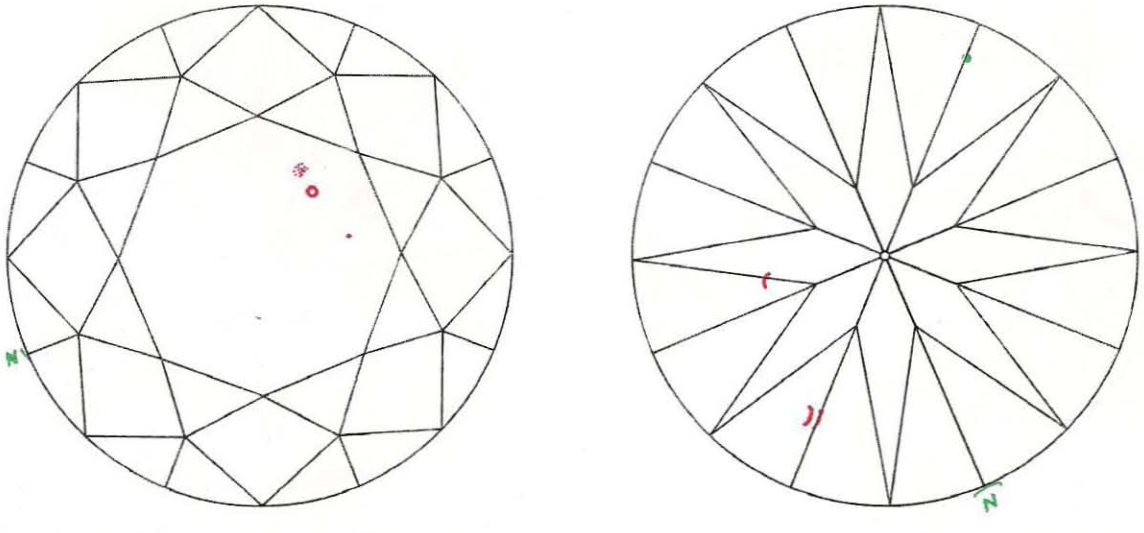


FIG. 61 A CRYSTAL, GROUPS OF PINPOINTS, A SMALL CLEAVAGE, A MINOR NATURAL, AN INDENTED NATURAL AND A PIT

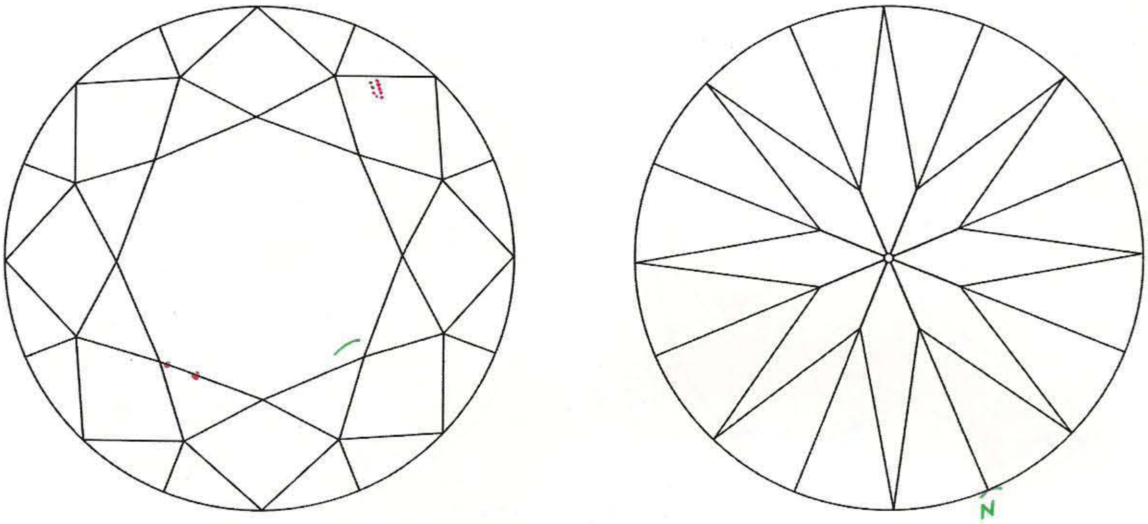


FIG. 62 REFLECTING CRYSTALS, A CRYSTAL UNDER A FACET EDGE, AN INDENTED NATURAL, A SCRATCH AND A ROUGH CULET

7.3.10.14 *Slightly included/small inclusions SI2* (see *Fig. 63)*

SI2 diamonds shall contain noticeable internal characteristics/inclusions which shall be very easy to observe when examined under 10 × magnification.

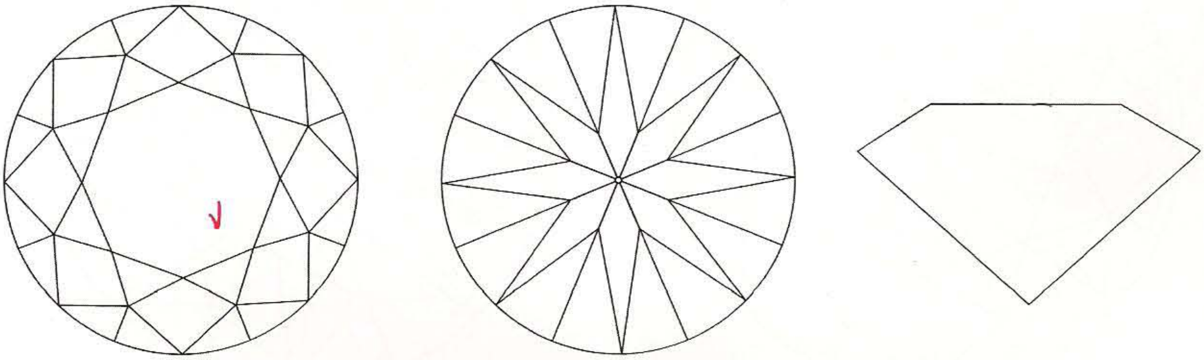


FIG. 63 DISTINCT INCLUSIONS IMMEDIATELY UNDER THE TABLE

7.3.10.15 *Clarity Grade SI2* (see *Fig. 64 to Fig. 71)*

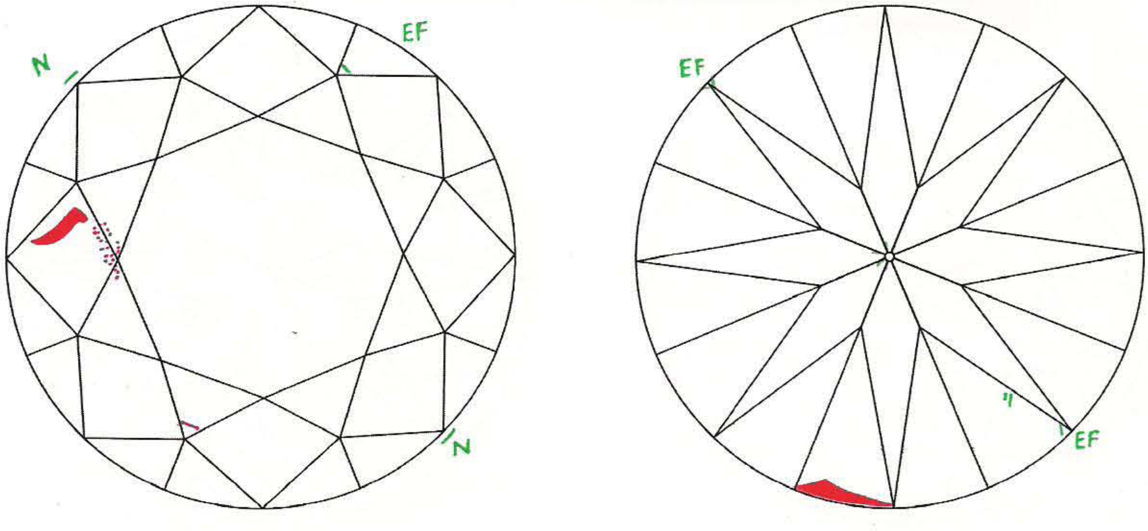


FIG. 64 A FEATHER, GROUPS OF CRYSTALS AND DARK INCLUSIONS OUTSIDE THE TABLE, A CLOUD VISIBLE ONLY FROM BELOW, MINOR NATURALS, EXTRA FACETS, SCRATCHES AND AN ABRADED CULET

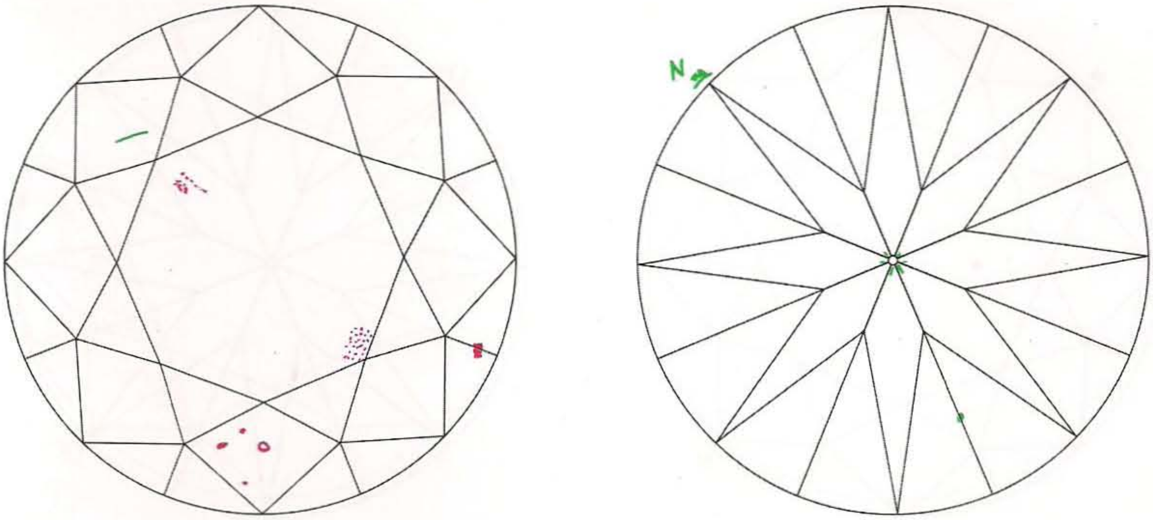


FIG. 65 A CRYSTAL SURROUNDED BY A CLOUD, A CLOUD OF PINPOINTS, A GROUP OF SMALL CRYSTALS, A SMALL CLEAVAGE, A NATURAL WITH TRIGONS, A SCRATCH, A PIT AND AN ABRADED CULET

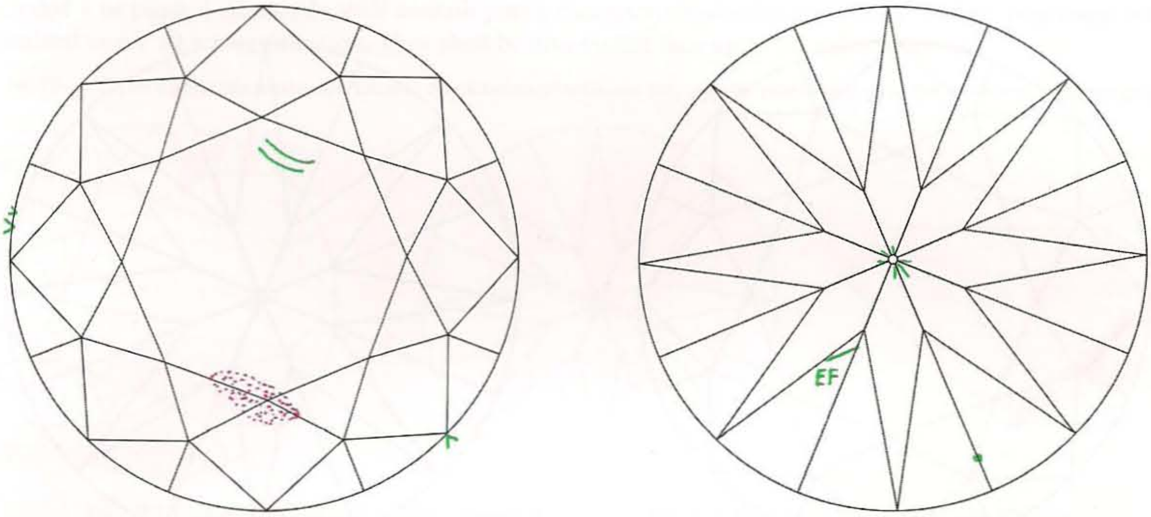


FIG. 66 A GROUP OF CRYSTALS AND DARK PINPOINTS AT THE EDGE OF THE TABLE, GIRDLE NICKS, SCRATCHES, AN EXTRA FACETS, A PIT, A NICK AND AN ABRADED CULET

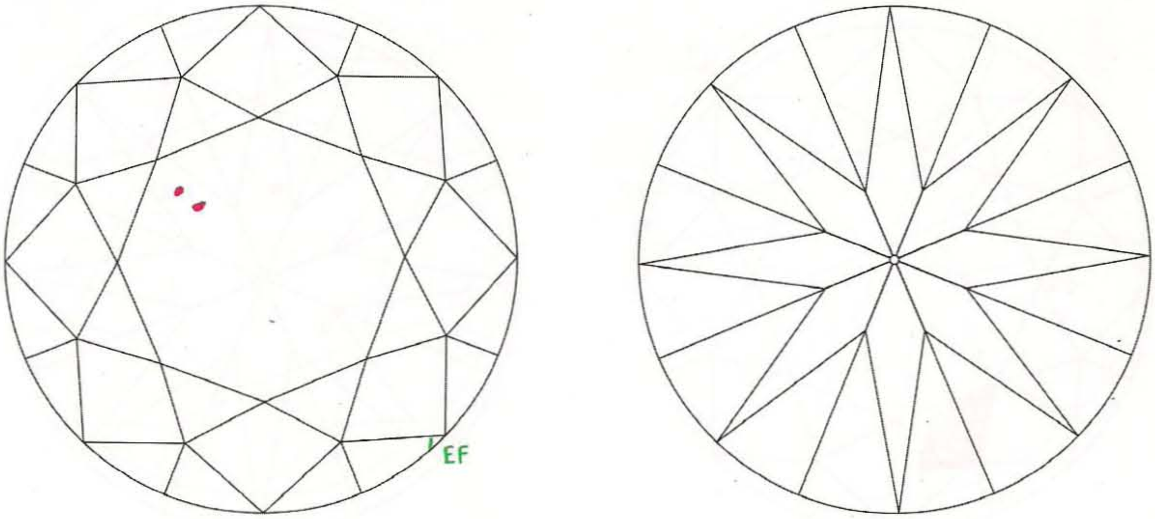


FIG. 67 CRYSTALS UNDER THE TABLE, SURROUNDED BY A CLOUD, AND AN EXTRA FACET

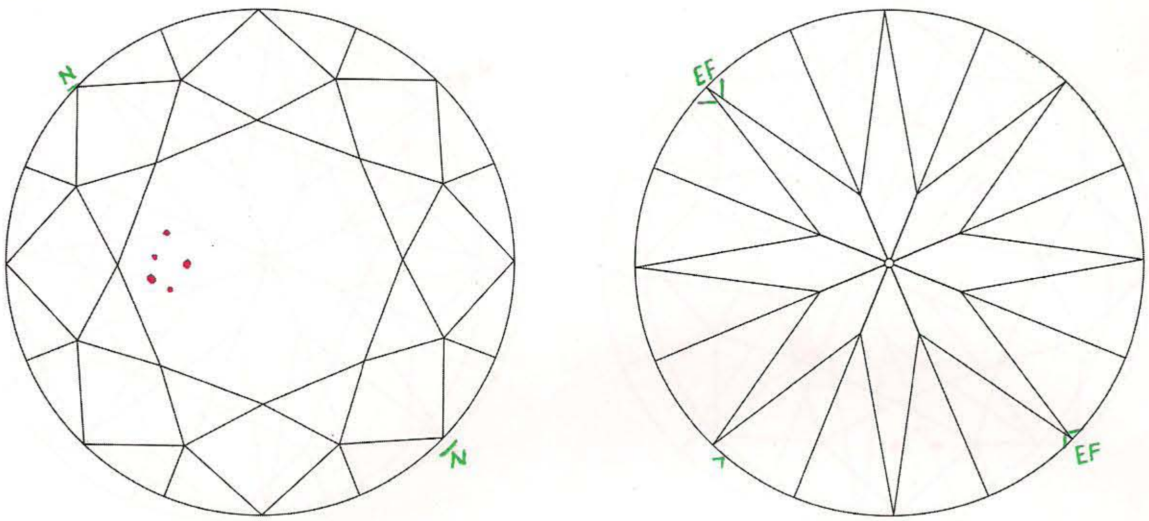


FIG. 68 A GROUP OF CRYSTALS UNDER THE TABLE, MINOR NATURALS, EXTRA FACETS, A GIRDLE NICK AND A PITTED GIRDLE

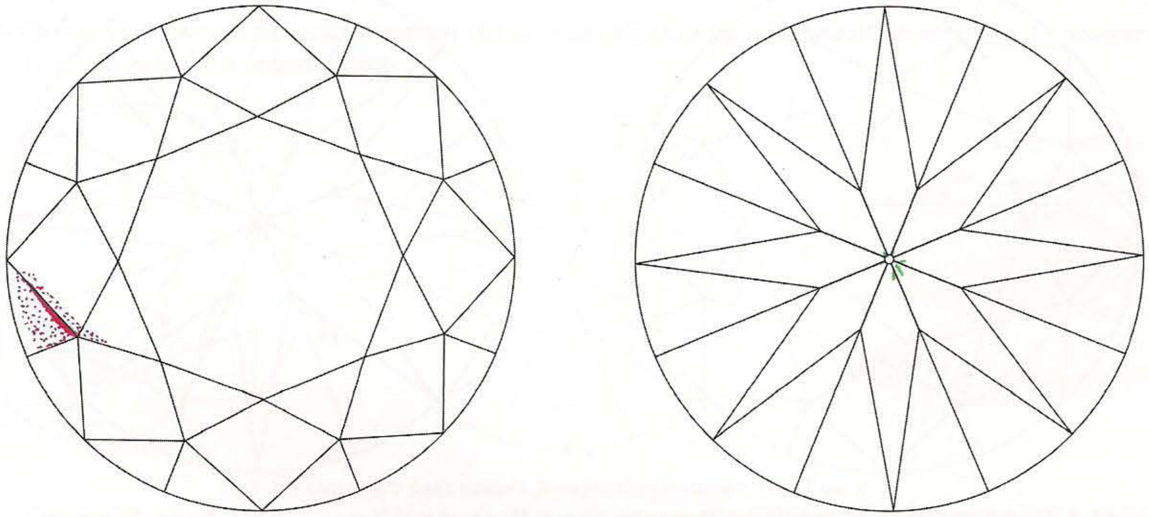


FIG. 69 A DISTINCT CLOUD AND A ROUGH CULET

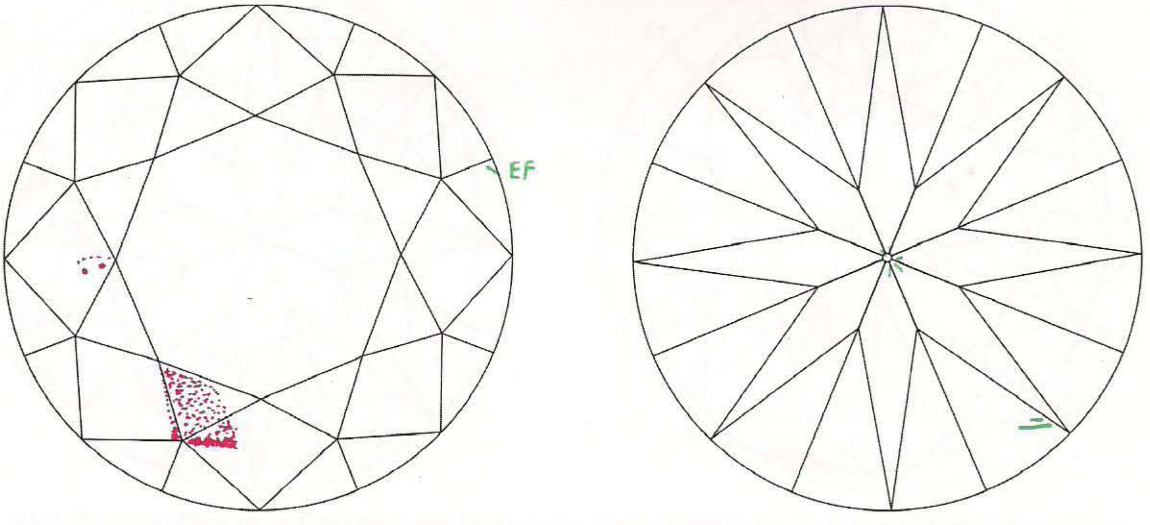


FIG. 70 A CLOUD AND A GROUP OF DARK PINPOINTS OUTSIDE THE TABLE, AN EXTRA FACET, SCRATCHES AND A ROUGH CULET

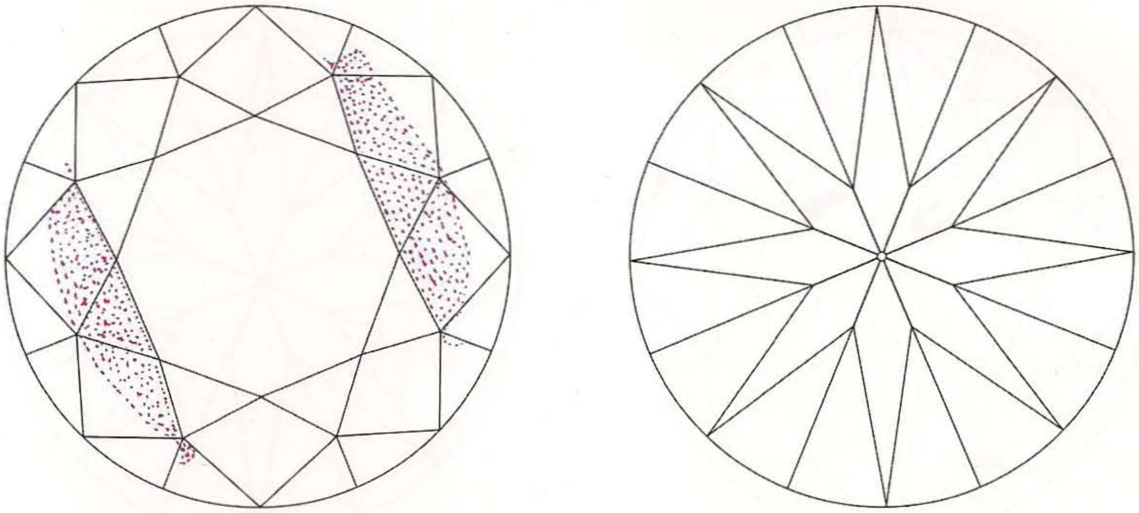


FIG. 71 CLOUDY AREAS

7.3.10.16 *Included 1 or pique I I1/P1* (see *Fig. 72)*

Included 1 or pique 1 diamonds shall contain intern characteristics/inclusions which shall be prominent when examined under 10 × magnification. They shall be also visible face up to the naked eye.

NOTE — Under certain circumstances, internal characteristics/inclusions may also be visible face up to the naked eye in higher grades.

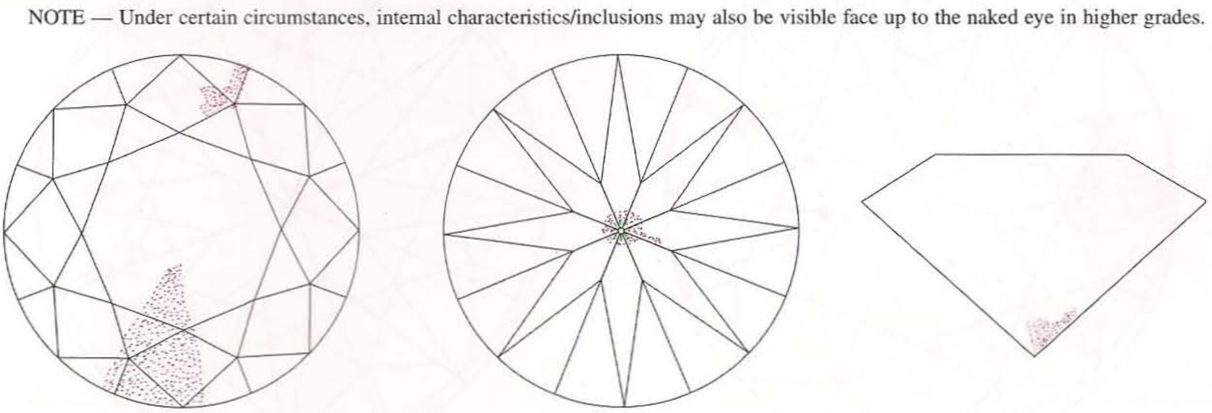


FIG. 72 LARGE CLEAVAGES, A REFLECTING CLEAVAGE NEAR A CULET AND AN ABRADED CULET

7.3.10.17 *Clarity grade I1/P1* (see *Fig. 73 to Fig. 80)*

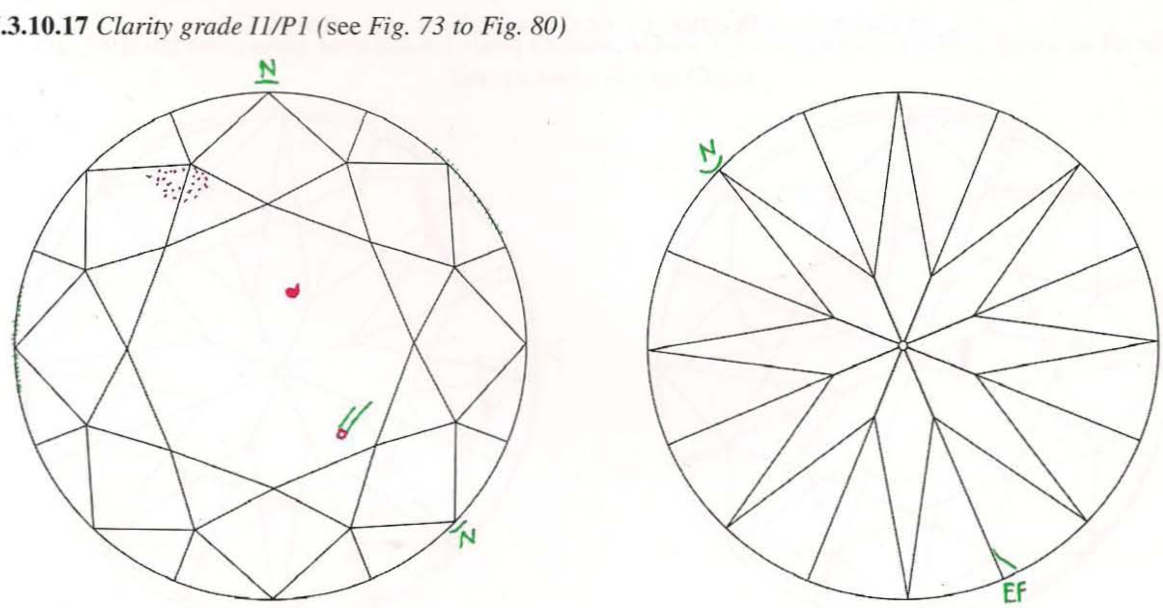


FIG. 73 A REFLECTING DARK SPOT, A CRYSTAL, A GROUP OF CRYSTALS, SCRATCHES, MINOR NATURALS AND AN INDENTED NATURAL, AN EXTRA FACET AND AREAS OF PITTED GIRDLE

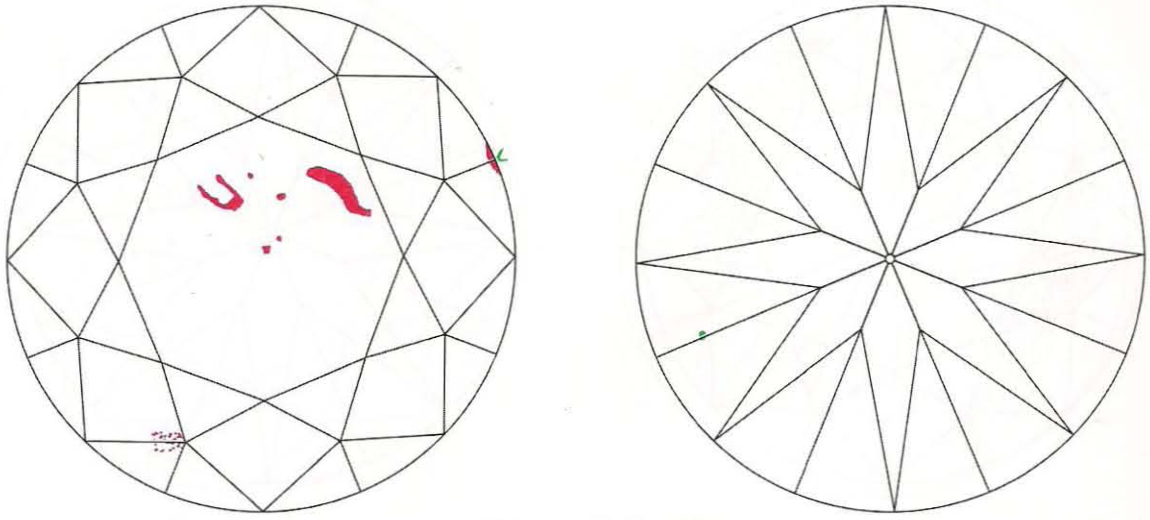


FIG. 74 A GROUP OF DARK SPOTS, A CLEAVAGE, A GROUP OF CRYSTALS, A GIRDLE NICK SURROUNDED BY A CLOUD AND A PIT

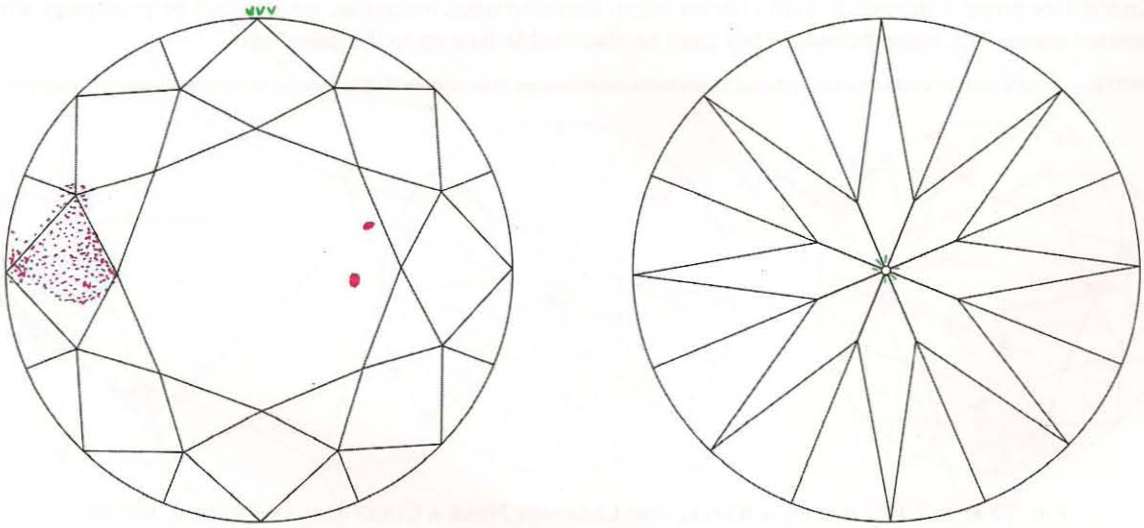


FIG. 75 CRYSTALS, A FEATHER, CLOUDS, GIRDLE NICK AND A ROUGH CULET

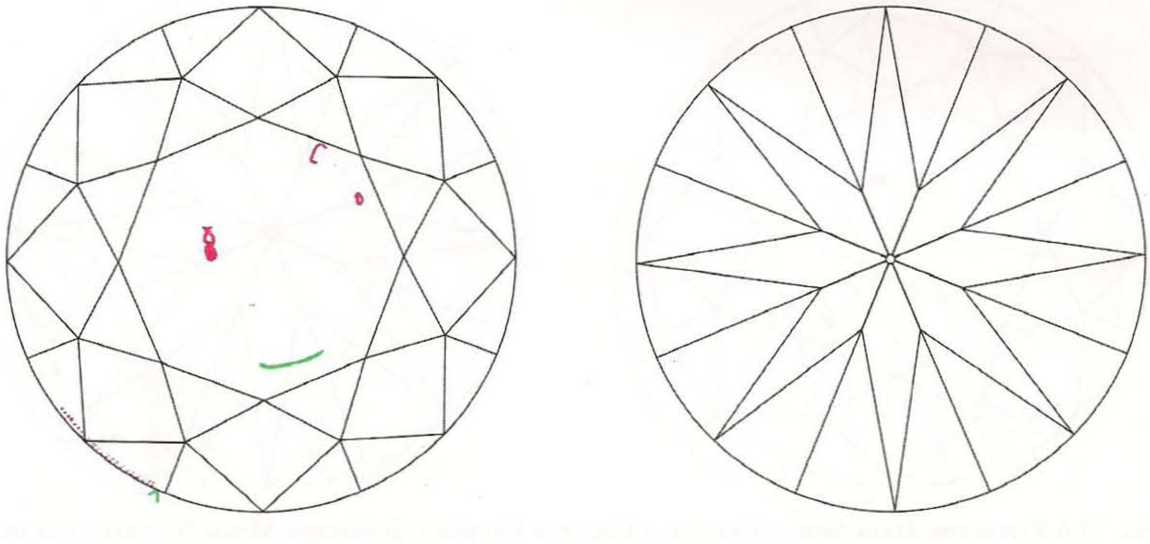


FIG. 76 A REFLECTING A DARK INCLUSION WITH A CRYSTAL AND BEARDING, A CRYSTAL, GIRDLE NICKS AND A SCRATCH

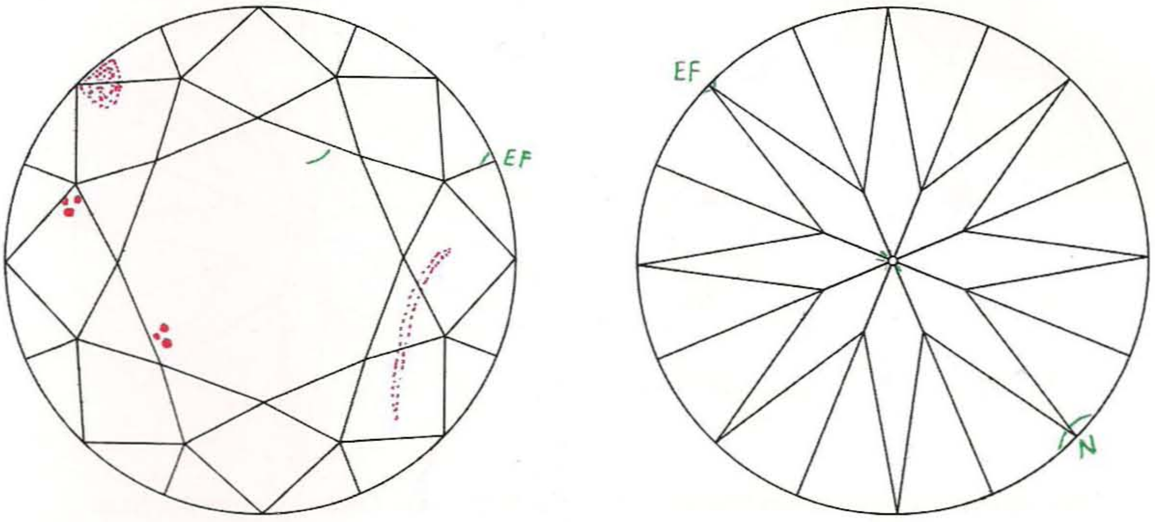


FIG. 77 A GROUP OF CRYSTALS, A GROUP OF DARK INCLUSIONS, A CLOUD, GROWTH LINES, A SCRATCH, EXTRA FACETS, AN INDENTED NATURAL AND AN ABRADED CULET

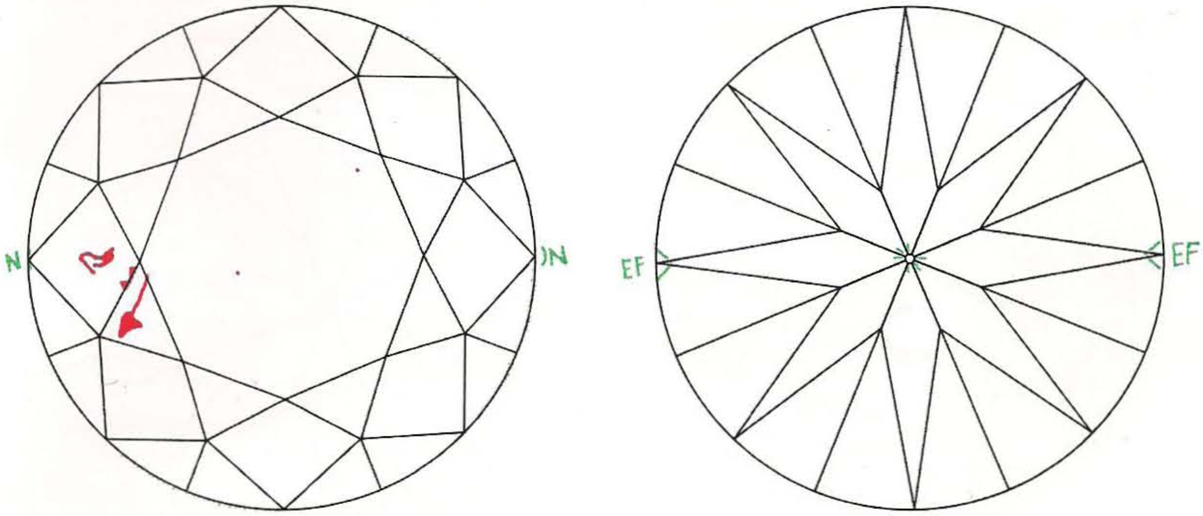


FIG. 78 DARK INCLUSIONS WITH SURROUNDING CLOUDS, MINOR NATURAL, EXTRA FACETS, AREAS OF PITTED GIRDLE AND A ROUGH CULET

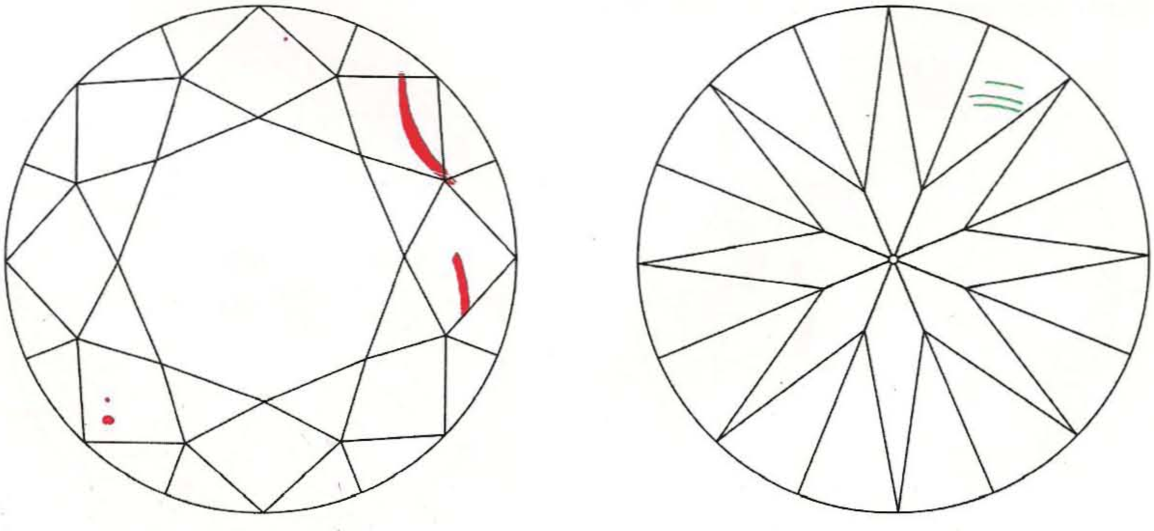


FIG. 79 A CRYSTAL, A COLOURED CLEAVAGE AND SCRATCHES

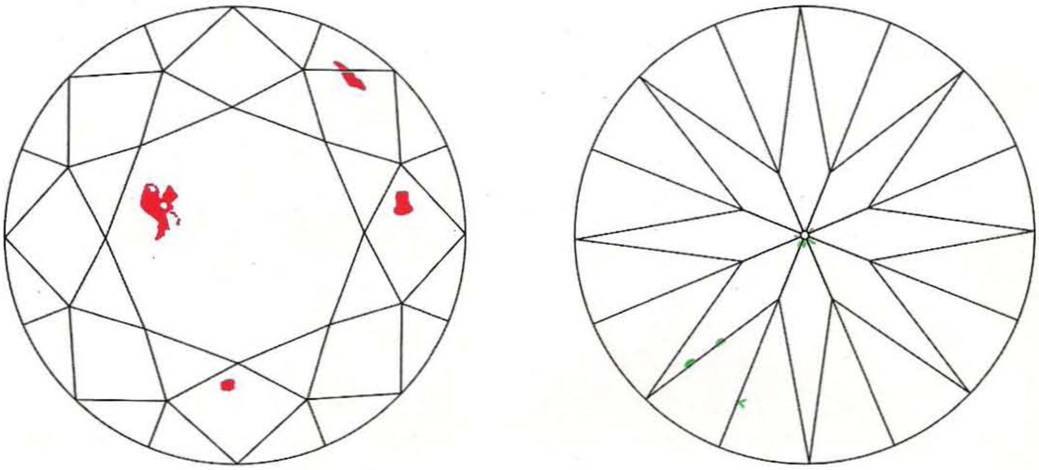


FIG. 80 DARK INCLUSIONS AND FEATHERS, ONE SURROUNDED BY A CLOUD OF WHICH IS A NICK, PITS AND AN BRADED CULET

7.3.10.18 *Included 2 or pique 2 (I2/P2)* (see *Fig. 81*)

Included 2 or pique 2 diamonds shall contain internal characteristics/inclusions which shall be very prominent when examined under 10 × magnification. They shall be easily visible up to the naked eye, slightly reducing the brilliancy of the diamond.

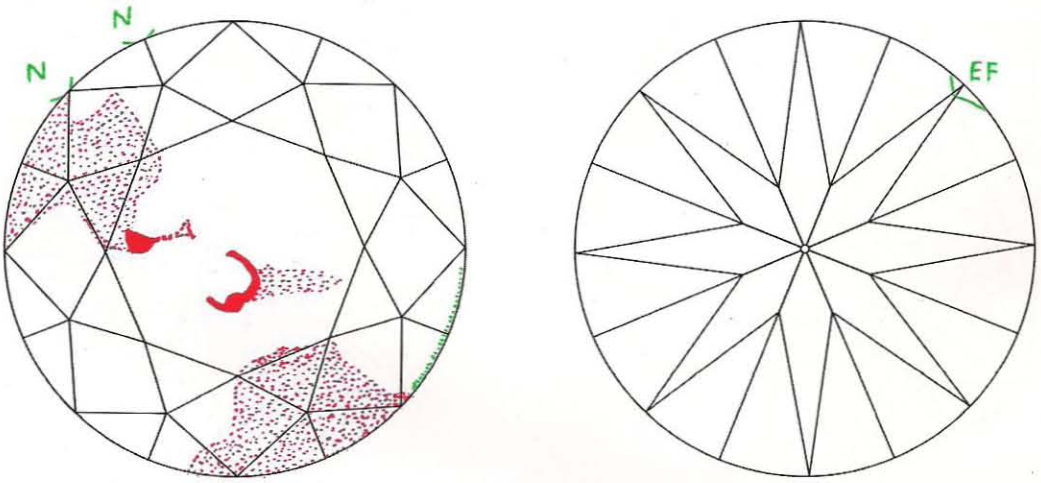


FIG. 81 COLOURLESS AND DARK INCLUSIONS, CLOUDY AREAS, NATURALS, A MINOR NATURAL, AN EXTRA FACET AND A PITTED GIRDLE; SUBSTANTIAL DECREASE IN TRANSPARENCY AND BRILLIANCY

7.3.10.19 *Clarity grade I2/P2* (see *Fig. 82 to Fig. 89*)

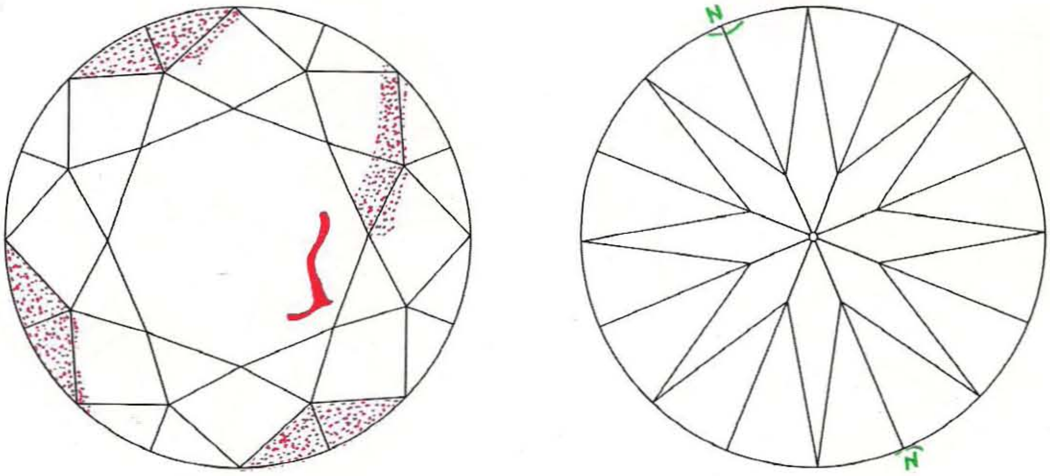


FIG. 82 A DARK INCLUSION, PARTLY COLOURED CLEAVAGES, CLOUDY AREAS AND INDENTED NATURALS

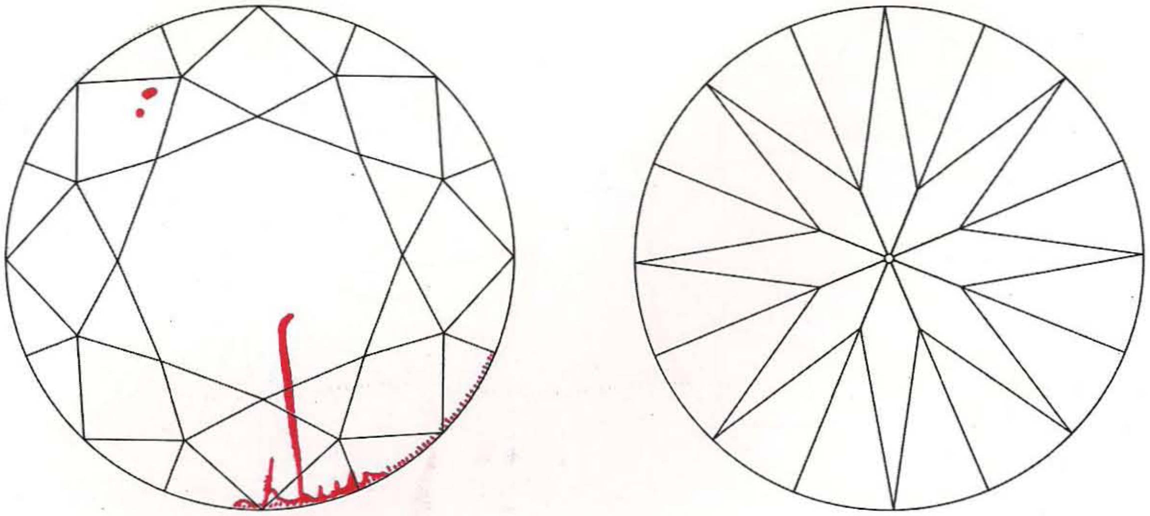


FIG. 83 LARGE GIRDLE BEARDING, DARK INCLUSIONS AND A PITTED GIRDLE

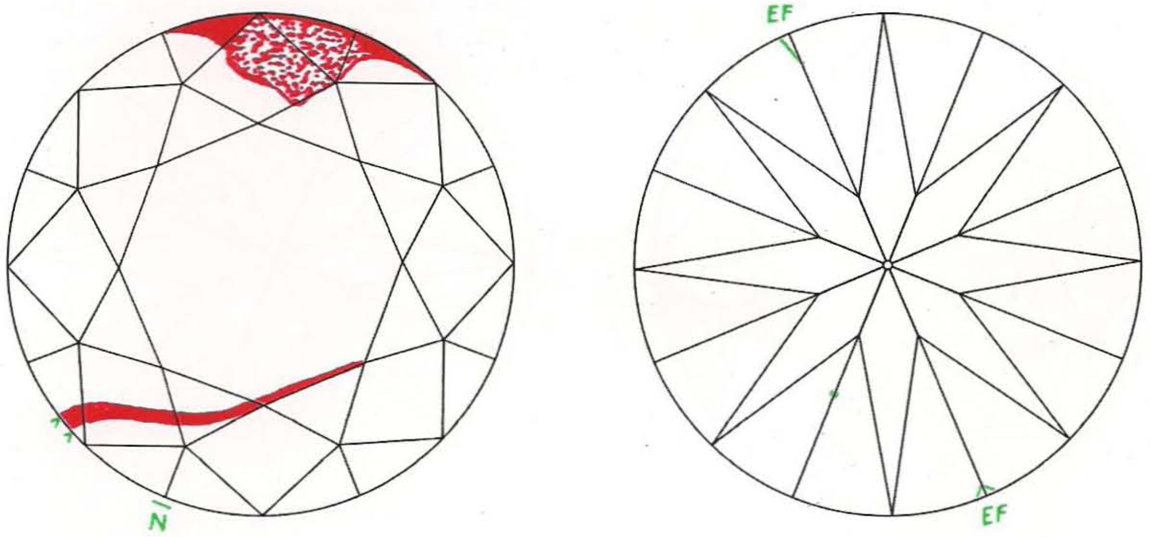


FIG. 84 A COLOURED CLEAVAGE WITH A CLOUD, A CLOUDY AREA, MINOR NATURAL, EXTRA FACETS, A PIT AND GIRDLE NICKS

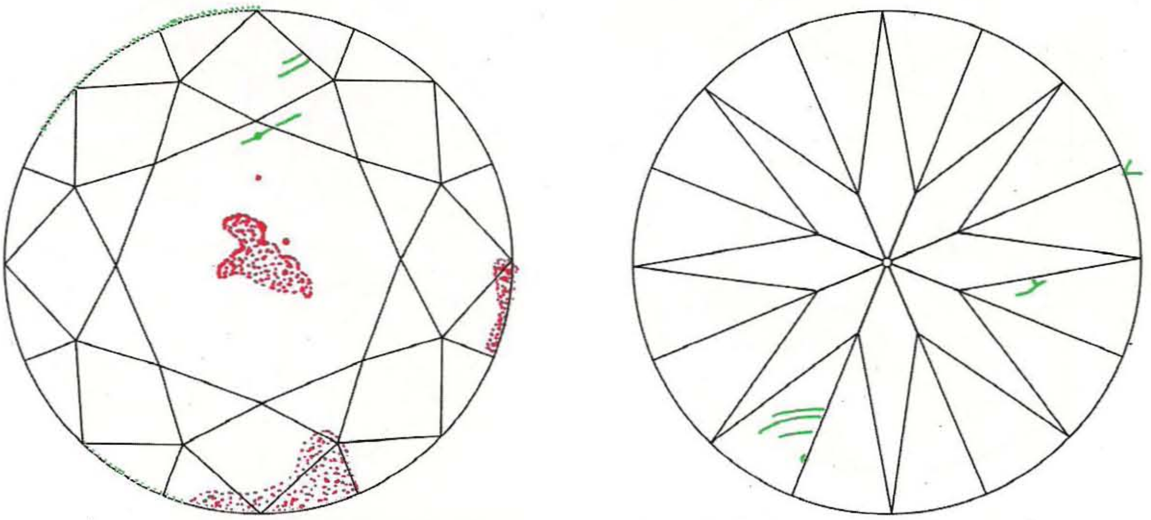


FIG. 85 A DARK INCLUSION, CLOUDS, SCRATCHES, PITS AND A GIRDLE NICK

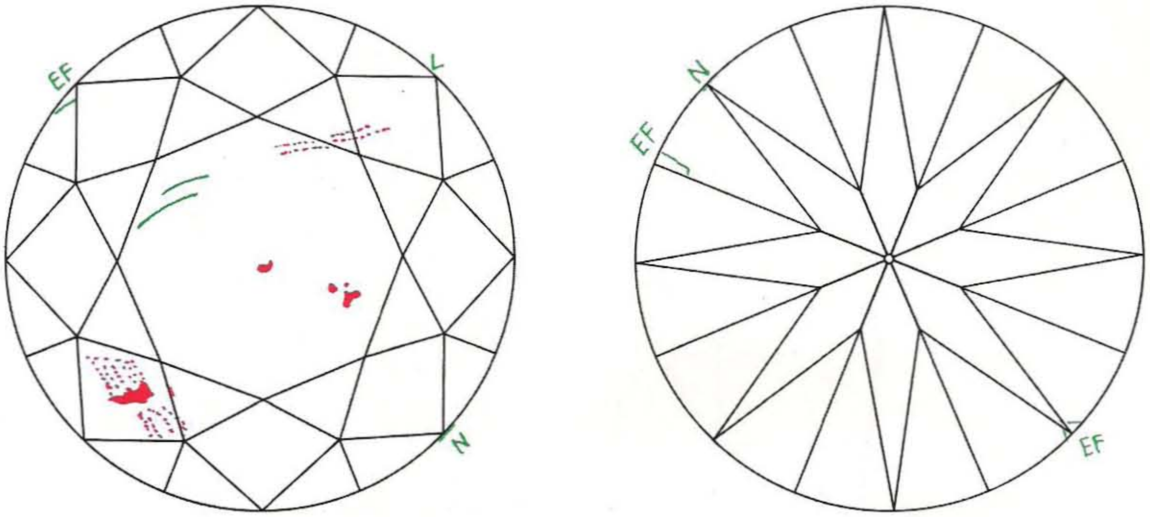


FIG. 86 A GROUP OF DARK INCLUSIONS, CRYSTALS SURROUNDED BY A CLOUD, GROWTH LINES, SCRATCHES, A GIRDLE NICK, EXTRA FACETS, A NATURAL AND AN INDENTED NATURAL

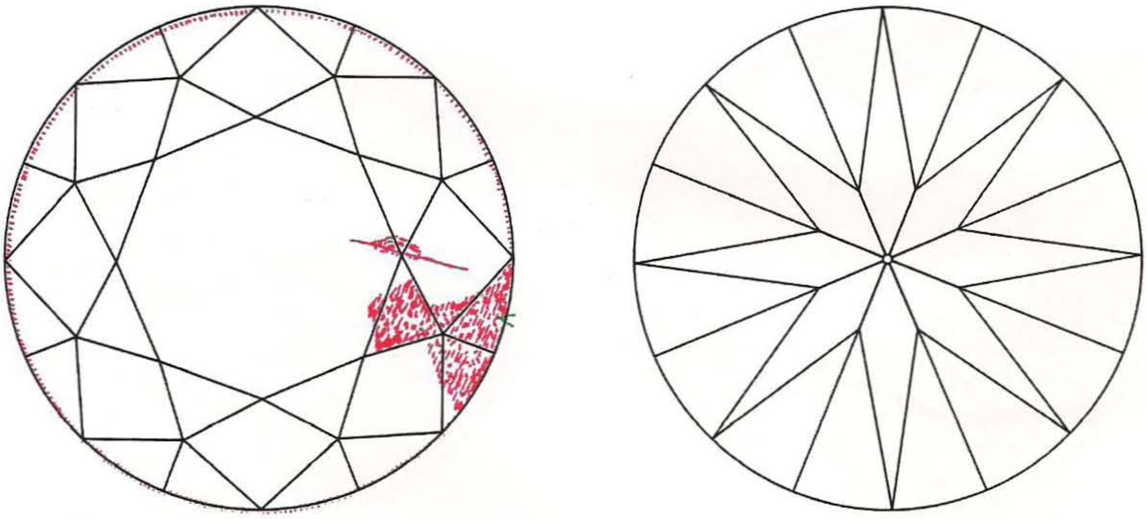


FIG. 87 A CLEAVAGE SURROUNDED BY A CLOUD, A CLOUDY AREA AND A GIRDLE NICK

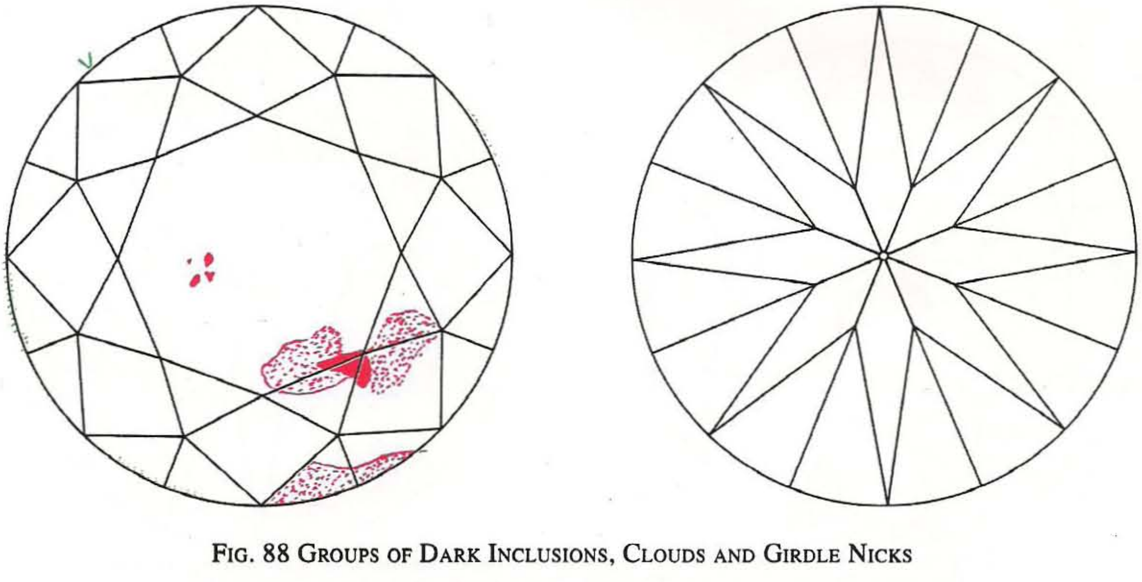


FIG. 88 GROUPS OF DARK INCLUSIONS, CLOUDS AND GIRDLE NICKS

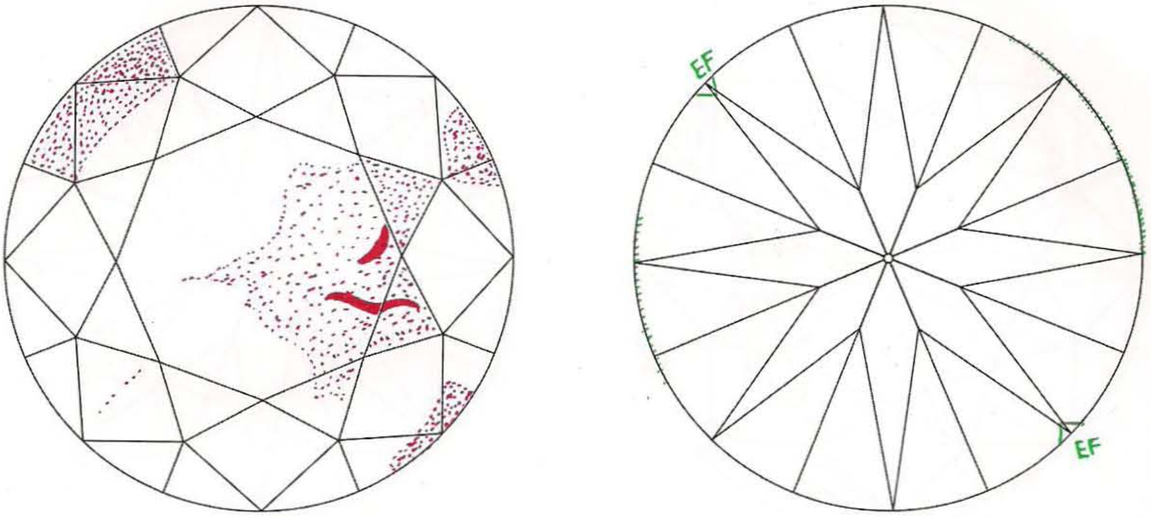


FIG. 89 CLEAVAGES, GROUPS OF MINUTES CRYSTALS AND CLOUDS

7.3.10.20 *Included 3 or pique 3 (I3/P3)* (see *Fig. 90)*

Included 3 or pique 3 diamonds shall contain internal characteristics/inclusions which shall be extremely prominent when examined under 10 × magnification. They shall be also very easily visible face up to the unaided eye, reducing the brilliancy of the diamond (*see* Fig. 90).

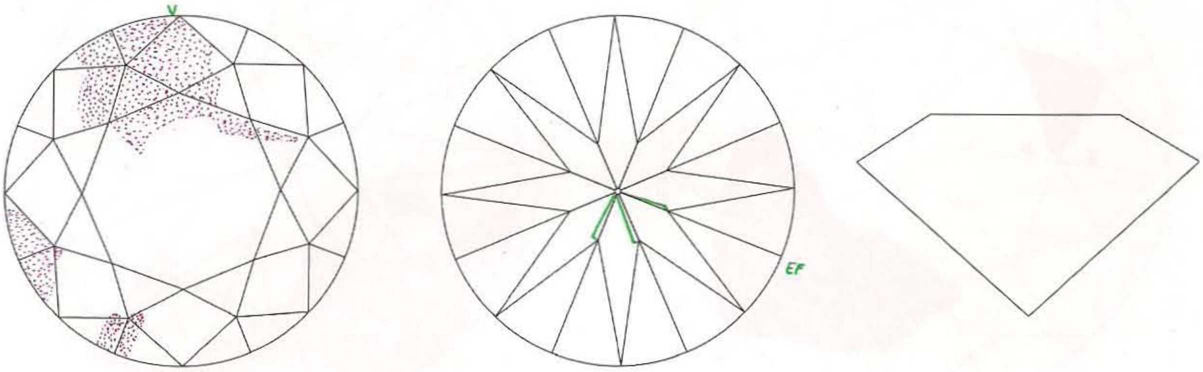


FIG. 90 DARK INCLUSIONS, COLOURED CLEAVAGES, CLOUDS AND A GIRDLE NICK

7.3.10.21 *Clarity grade I3/P3* (see *Fig. 91 to Fig. 98)*

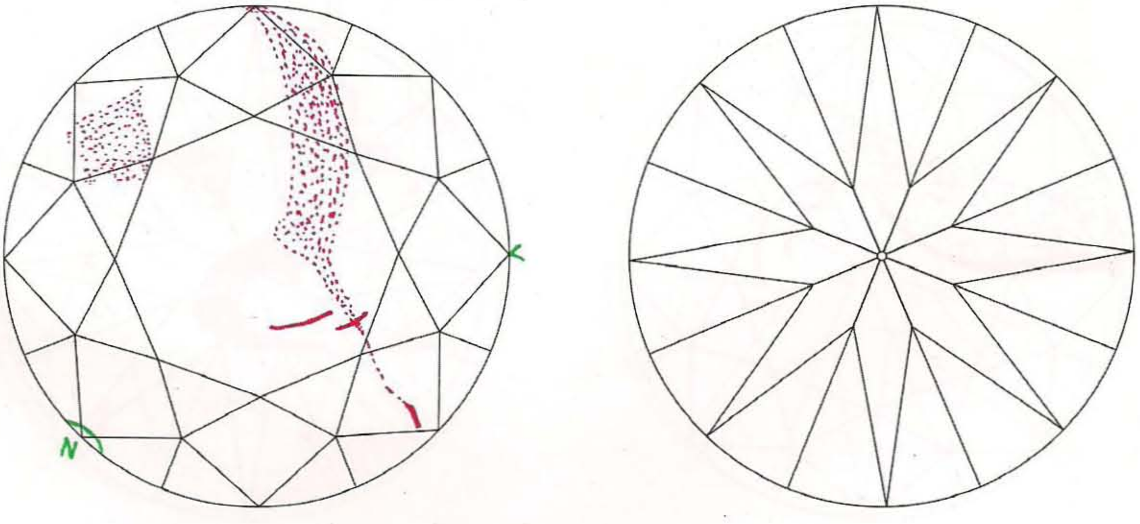


FIG. 91 A GROUP OF DARK INCLUSIONS, A COLOURED CLEAVAGE, CLOUDS, A GIRDLE NICK AND AN INDENTED NATURAL

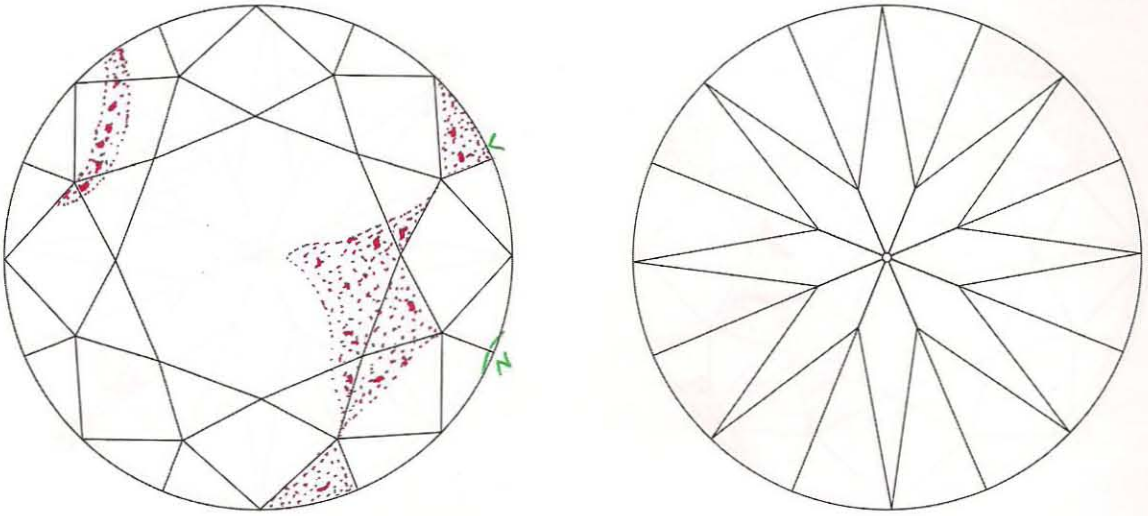


Fig. 92 Numerous Crystals and Dark Inclusions, a Feather Surrounded by a Cloud, Girdle Nick and an Indented Natural

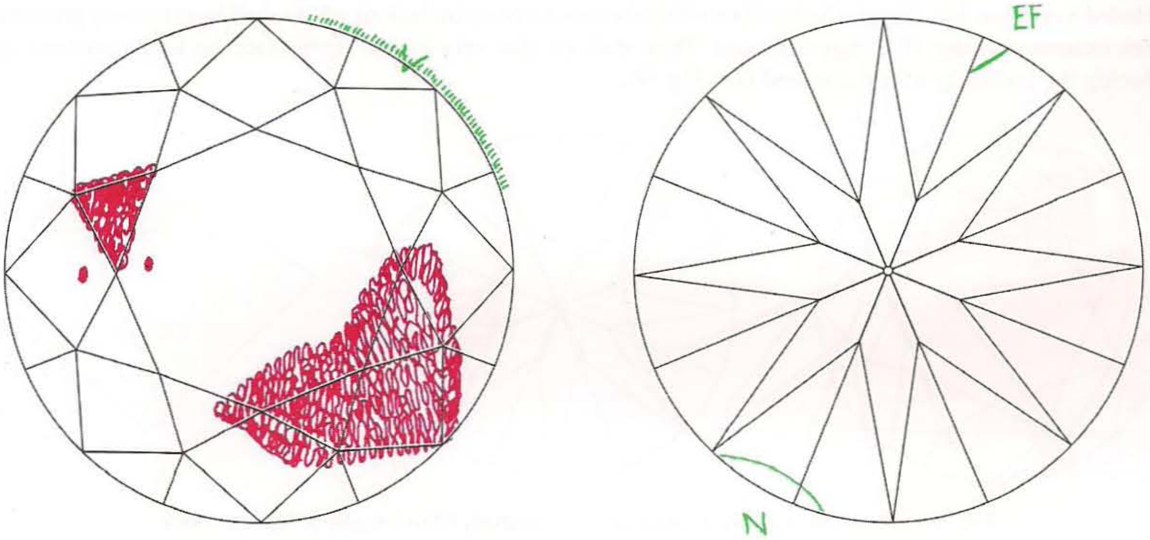


Fig. 93 A Dark Inclusion Surrounded by a Cloud, Crystals, a Cloudy Area, a Girdle Nick, an Indented Natural and a Pitted Girdle

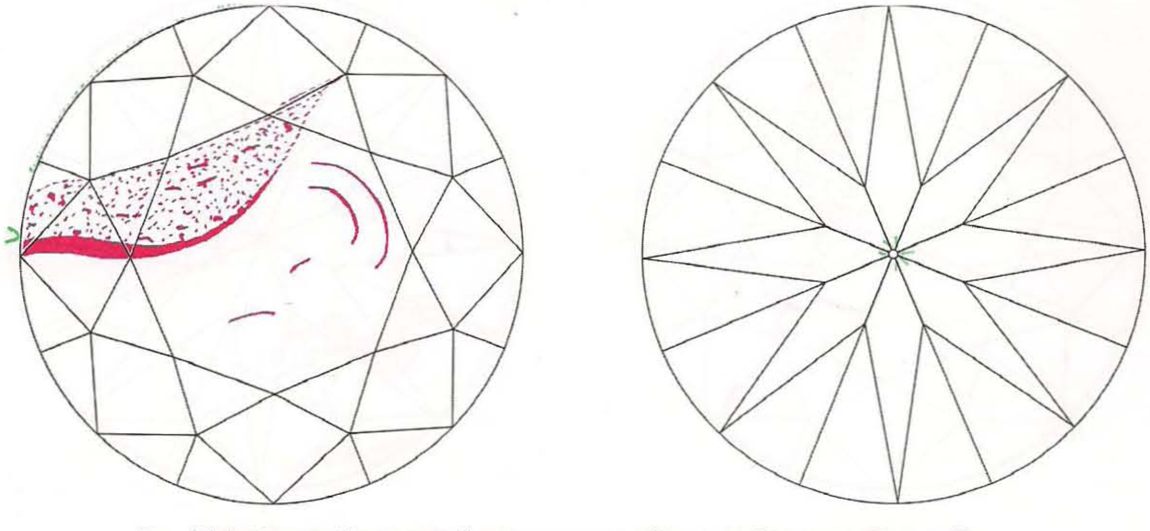


Fig. 94 A Partly Coloured Cleavage with a Cloud, a Nick on a Crown Facet Edge Pitted Girdle and a Rough Culet

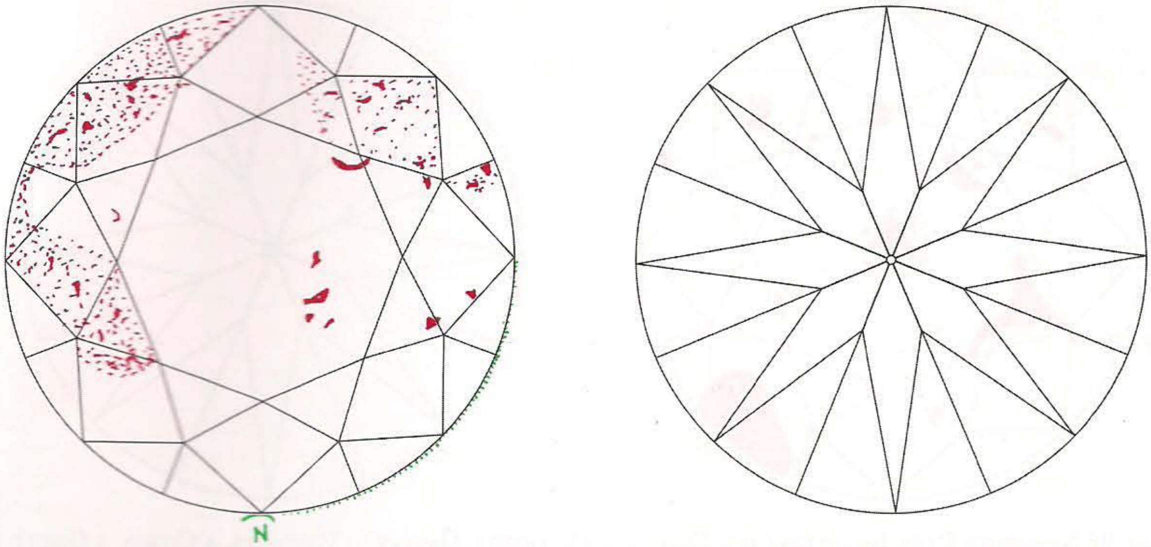


Fig. 95 Numerous Crystals and Dark Inclusions, Pinpoints, a Cloudy Area, an Indented Natural and a Pitted Girdle

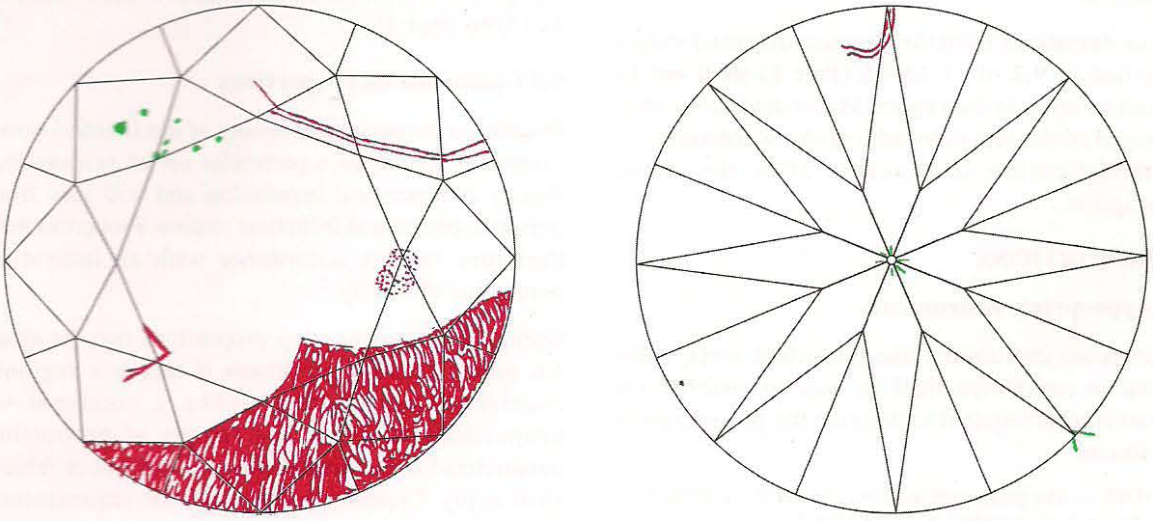


Fig. 96 Dark Inclusions, Cleavages and Clouds, Growth Lines, Pits, a Girdle Nick and an Abraded Culet

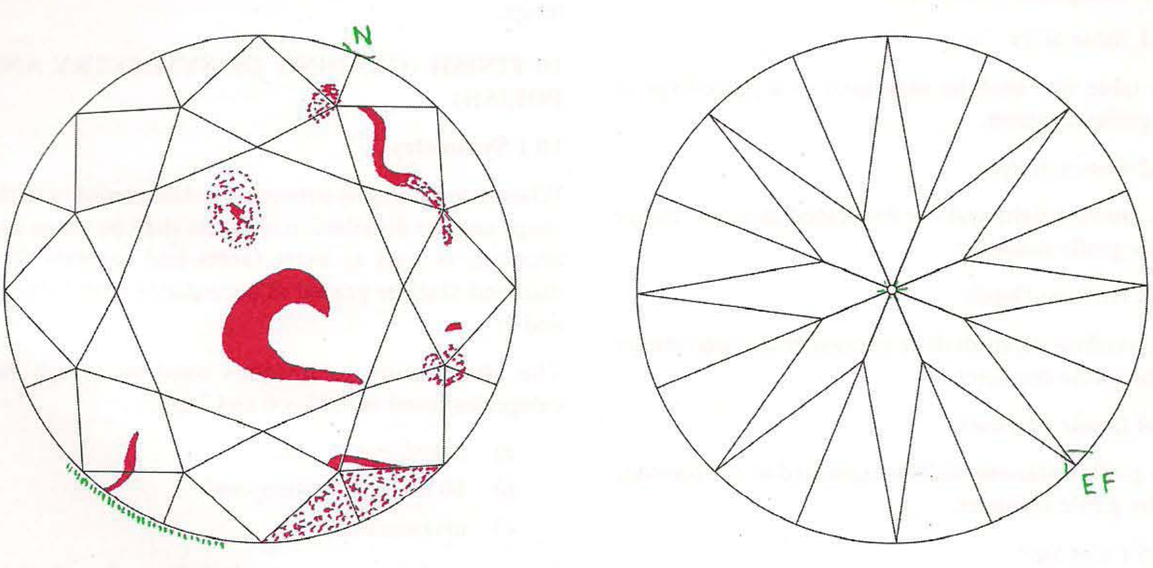


Fig. 97 Numerous Crystals and Dark Inclusions, Surrounded by Clouds, a Pitted Girdle and an Abraded Culet

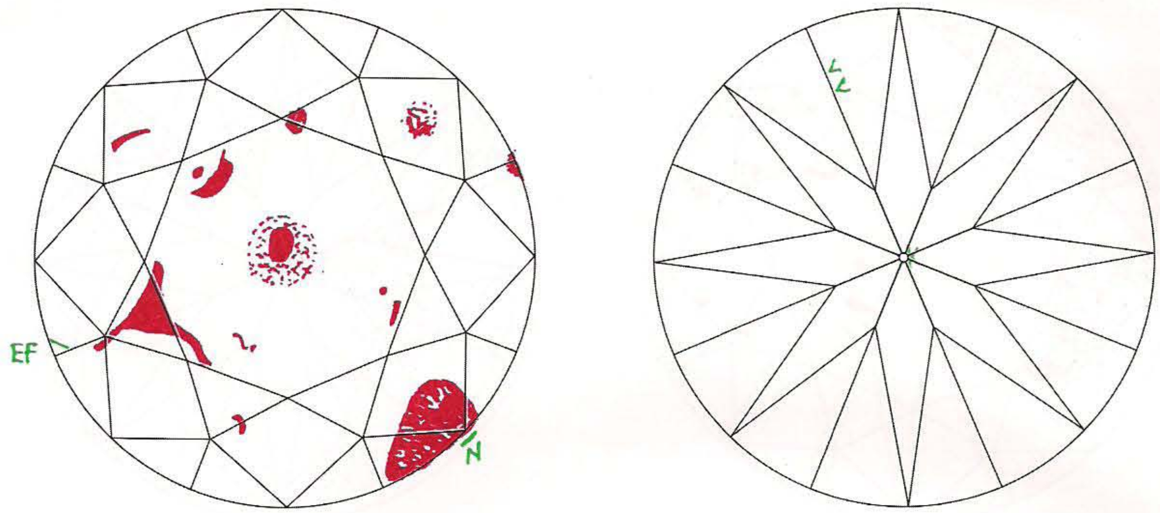


FIG. 98 NUMEROUS DARK INCLUSIONS AND COLOURED CLEAVAGES, GROUPS OF PINPOINTS, A CLOUD, A GIRDLE NICK, NICKS ON THE PAVILION FACET EDGE AND AN ABRADED CULET

8 SHAPE

Minor deviations from the common diamond shapes specified in **9.2** of IS 15766 (Part 1) shall not be remarked upon in the report. Major deviations shall be noted in the report by adding the word variation or modification in brackets after the shape description.

9 PROPORTIONS

9.1 Appropriate Instruments

Appropriate instruments like proportion scope either digital or convention shall be used to establish the measurements required to describe the proportions of a diamond.

NOTE — The parameters used to establish the proportions of a diamond are specified IS 15766 (Part 1).

9.2 Description

9.2.1 *Table Sizes*

The table size shall be expressed as a percentage of the girdle diameter.

9.2.2 *Crown Height*

The crown height shall be expressed as a percentage of the girdle diameter.

9.2.3 *Pavilion Depth*

The pavilion depth shall be expressed as a percentage of the girdle diameter.

9.2.4 *Girdle Thickness*

The girdle thickness shall be expressed as a percentage of the girdle diameter.

9.2.5 *Culet Size*

The culet size shall be expressed as a percentage of the girdle diameter, in accordance with **9.3.7** of IS 15766 (Part 1).

9.3 Comments on Proportions

In order to maximize the beauty of the finished stone, diamonds are cut to a particular set of proportions. Beauty is a personal impression and will vary from person to person and from time to time. Properties may therefore vary in accordance with an individual perception of beauty.

Optionally, a comment on proportions may be given for round brilliant cut stones if this is a regional requirement or custom. When a comment on proportions is given, the ranges of proportion parameters for the round brilliant cut set out in Table 5 shall apply. Depending upon regional requirements, language or custom the descriptive terms range (a), range (b) and range (c) shall be replaced by alternative terms.

10 FINISH (GRADING OF SYMMETRY AND POLISH)

10.1 Symmetry

When determining symmetry, the characteristics of the shape and the distribution of facets shall be taken into account, as well as extra facets and naturals. The diamond shall be graded in accordance with Tables 6 and 7:

The observation techniques used to assign the categories listed in Tables 6 and 7 are:

a) naked eye;
b) 10 × magnification; and
c) measurements.

Examples of the symmetry deviations that shall be considered are set out in Tables 6 and 7.

Table 5 Examples of Ranges of Proportions for the Round Brilliant Cut

(*Clause* 9.3)

Criterion (1)	Range (c) (2)	Range (b) (3)	Range (a) (4)	Range (b) (5)	Range (c) (6)
Crown angle	Up to 26.9°	27.0° to 30.6°	30.7° to 37.7°	37.8° to 40.6°	40.7° and above
Pavilion angle	Up to 38.4°	38.5° to 39.5°	39.6° to 42.2°	42.3° to 43.1°	43.2° and above
Table size (% $Ø_t$)	Up to 50	51 to 52	53 to 66	67 to 70	71 and above
Crown height (% C_h)	Up to 8.5	9 to 10.5	11 to 16	16.5 to 18	18.5 and above
Girdle thickness (%)	Up to 0.5	1 to 1.5	2 to 4.5	5 to 7.5	8 and above
Pavilion depth (% P_d) (for pointed culet)	Up to 39.5	40 to 41	41.5 to 45	45.5 to 46.5	47 and above
Culet size (%)	—	—	Pointed to 1.9	2 to 3.9	4 and above
Total depth (% t_d)	Up to 52.9	53 to 55.4	55.5 to 63.9	64.0 to 66.9	67.0 and above

NOTE — The brilliancy and fire of a diamond are largely determined by the angles of inclination and the proportional relationship between various parts of the stone. If these are not optimal, specific undesirable effects. Such as "fish-eye", "culet visible in bezels", etc, can occur. When judging the proportions of a polished diamond, the main issue is to evaluate if and to what extent these effects occur.

Table 6 Symmetry Deviations

(*Clause* 10.1)

Visibility 10 × (1)	Option 1 (2)	Option 2 (3)
No symmetry deviations	Very good	Excellent
Negligible visible symmetry deviation		Very good
Hardly visible or minor symmetry deviations	Good	Good
Visible symmetry deviations	Medium/Fair	Medium/Fair
Major symmetry deviations	Poor	Poor

Table 7 Symmetry: Extra Facets and Naturals

(*Clause* 10.1)

Location – Size (1)	Visibility Through Crown Side 10 × (2)	Option 1 (3)	Option 2 (4)	FL or IF – LC (5)
Cs[1] Exceptionally small --------------------- Ps[1]–Very small	Very hard --------------------- Not	Very good Negligible external characteristic[3]	Excellent	FL - LC
Ps – Small	Not		Very good negligible external characteristic	FL - LC
Cs–Very small	Hard			
Cs – Small --------------------- Ps – Large	Easy --------------------- Hard	Good	Good	IF -LC
Ps– Very large	Easy		Medium/Fair Important extra facet - natural	IF -LC
Cs – Large	Very easy also to the naked eye	Medium/Fair Important extra facet-natural		
Ps – Exceptional large --------------------- Cs – Very large	Very easy ----------------- Very easy disturbing to the naked eye	Poor important extra facet-natural	Poor important extra facet -natural	IF -LC

[1] Crown side.

[2] Pavilion side.

[3] Description only to be mentioned with LC and FL, the most important description alone shall be mentioned.

ANNEX A

(Foreword)

GEMMOLOGICAL INSTRUMENTS REQUIRED FOR A GEM TESTING LABORATORY

Sl No.	*Name of the Instrument*
i)	Refractrometer
ii)	Microscope (Diascope)
iiii	Spectroscope
iv)	Polariscope
v)	Dichroscope
vi)	Hardness pencil
vii)	U.V. Light
viii)	S.G. Liquids
ix)	Mettler Balance and Specific Gravity attachment
x)	Millimeter gauge
xi)	10 × Lens, tweezers
xii)	Proportionscope for diamonds
xiii)	Master diamonds for colour grading
xiv)	Gemmological books
xv)	Diamond pen
xvi)	Diamond spotter
xvii)	Diamond view/ diamond sure

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Precious Metals Sectional Committee, MTD 10

Organization	*Representative(s)*
India Government Mint, Hyderabad	SHRI M. J. RAY (***Chairman***)
	SHRI S.R. PATTABARDHAN (*Alternate*)
Bhabha Atomic Research Centre, Trombay, Mumbai	DR M. SUDERSANAN
Consumer Education and Research Centre, Ahmedabad	DR C. J. SHISHOO
	SHRI S. YELLORE (*Alternate*)
Consumer Guidance Society of India, Mumbai	SHRI N. G. WAGLE
	DR A.R. CHENOY (*Alternate*)
Gemological Institute of India, Mumbai	SHRI K. T. RAMACHANDRAN
	DR JAYSHREE PANAJIKAR (*Alternate*)
Geological Survey of India, Kolkata	SHRI M. M. MUKHRERJEE
	SHRI J. N. DAS (*Alternate*)
Geological Survey of India, Hyderabad	DR C. R. M. RAO
	DR A. D. NEJKAR (*Alternate*)
Gujarat Bullion Refinery (P) Ltd, Ahmedabad	SHRI J. N. KANSARA
	SHRI DILIP R. KANSARA (*Alternate*)
Gujarat Gold Centre, Ahmedabad	SHRI SURESH C. KANSARA
	SHRI ANIL C. KANSARA (*Alternate*)
Harsh Precious Metals Pvt Ltd, Mumbai	SHRI VIJAY GOPANI
	SHRI RIPLA GANDHI (*Alternate*)
Hindustan Diamond Company, Mumbai	SHRI V. MADHAVAN
	SHRI V. P. DUBEY (*Alternate*)
Hindustan Platinum Pvt Ltd, Mumbai	DIRECTOR
Hutti Gold Mines Co Ltd, Raichur, Karnataka	SHRI M. SHANKARGOUDA
	DR M. L. PATIL (*Alternate*)
Indian Diamond Institute, Surat	SHRI K. K. SHARMA
	SHRI SAMIR JOSHI (*Alternate*)
Indian Institute of Gems Jewellery, Mumbai	SHRI UMESH CHAVAN
Jalan Halmarking Centre, New Delhi	SHRI ISHWAR JALAN
Jetha Bhai Jhaveri, New Delhi	SHRI VIMAL JETHA
Kesar Assaying & Hallmarking Centre, Chennai	SHRI RAJ KUMAR M. JAIN
Medical Education Research (Dental), Mumbai	DIRECTOR
MMTC Ltd, New Delhi	GENERAL MANAGER
National Metallurgical Laboratory, Jamshedpur	SHRI K. K. GUPTA
	DR S. CHAKRABORTY (*Alternate*)
National Mineral Development Corporation Ltd, Hyderabad	SHRI G. P. KIMOTI
	SHRI M. N. AGARWAL (*Alternate*)
National Physical Laboratory, New Delhi	DR ANIL KUMAR GUPTA
National Refinery Pvt Ltd, Mumbai	SHRI CHANDRAKANT K. SHAH
	SHRI S. P. SONAWALA (*Alternate*)
The Gem & Jewellery Export Promotion Council, Mumbai	SHRI NAND KISHORE M. CHHABRA
	SHRI DILIP SHAH (*Alternate*)
Titan Industries Ltd, Hosur, Tamil Nadu	SHRI L. R. NATRAJAN
	SHRI M. ALAGAPPAN (*Alternate*)
Titan Industries Ltd, Mumbai	SHRI VIVEK MISHRA
	SHRI P. SELVARAJAN (*Alternate*)

Organization	*Representative(s)*
Varsha Bullion Hallmarking Centre, Mumbai	SHRI B. H. MEHTA SHRI A. D. NALAWADE (*Alternate*)
In personal capacity (*Sopan Baug Co-op. Housing Society, Flat No. 9, Building No. A-1-A, Pashan, Panchabati, Pune-411008*)	SHRI S. C. SAHA
BIS Directorate General	SHRI S. K. GUPTA, Scientist 'F' & Head (MTD) [Representing Director General (*Ex-officio*)]

Member Secretary
SHRI B. K. MUKHOPADHYAY
Scientist 'E' (MTD), BIS

Panel for Gemstones and Jewellery, 10/P-1

Gemological Institute of India, Mumbai	SHRI K. T. RAMACHANDRAN DR JAYSHREE PANAJIKAR (*Alternate*)
Geological Survey of India, Kolkata	SHRI M. M. MUKHERJEE SHRI J. N. DAS (*Alternate*)
Hindustan Diamond Company, Mumbai	SHRI VIRENDAR SINGH
Indian Diamond Institute, Surat, Gujarat	SHRI K. K. SHARMA
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